National Testing Agency

Notations :

1.Options shown in green color and with ✔ icon are correct.

2.Options shown in red color and with ✖ icon are incorrect.

Question Paper Name :	MATHEMATICAL SCIENCES 28th July 2025 Shift 2
Subject Name :	Mathematical Sciences
Creation Date :	2025-07-28 21:38:37
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Change Background Color :	No
Change Theme :	No
Help Button :	No
Show Reports :	No
Show Progress Bar :	No

MATHEMATICAL SCIENCES

Group Number :	1
Group Id :	5629542
Group Maximum Duration :	0
Group Minimum Duration :	180
Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	200

PART - A

Section Id :	5629544
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	15
Section Marks :	30
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	5629544
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 56295476 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

Consider the following statements:

Statement I: All Booklets are Manuals.
Statement II: All Manuals are Catalogues.

If Statements I and II are True, which one of the following conclusions can be conclusively drawn?

1. All Manuals are Booklets.
2. All Catalogues are Booklets.
3. All Booklets are Catalogues.
4. All Catalogues are Manuals.

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Question Number : 1 Question Id : 56295476 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

निम्नलिखित कथनों पर विचार करें :

कथन I: सभी पुस्तिकाएं नियमावलियां हैं
कथन II: सभी नियमावलियां सूचियां हैं

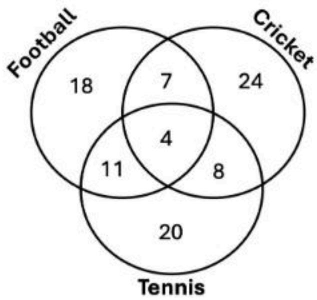
यदि कथन I और II सत्य हैं तो निम्न में से कौन सा निष्कर्ष निश्चित रूप से निकाला जा सकता है ?

1. सभी नियमावलियां, पुस्तिकाएं हैं
2. सभी सूचियां पुस्तिकाएं हैं
3. सभी पुस्तिकाएं, सूचियां हैं
4. सभी सूचियां नियमावलियां हैं

Question Number : 2 Question Id : 56295477 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

The given Venn diagram shows numbers of players playing one or more than one sport.



The percentage of players who play exactly two sports is closest to _____%.

1. 5
2. 14
3. 28
4. 32

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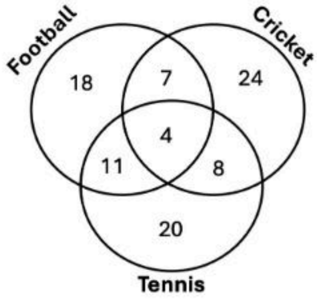
Question Number : 2 Question Id : 56295477 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

दिए गए वेन आरेख में उन खिलाड़ियों की संख्या प्रदर्शित की गई है जो एक या उससे अधिक खेलों को खेलते हैं।



उन खिलाड़ियों की प्रतिशतता जो ठीक दो खेल खेलते हैं .... % के निकटतम होगी

1. 5
2. 14
3. 28
4. 32

Question Number : 3 Question Id : 56295478 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

The value of a company is measured as the total value of its shares owned by different investors. Rakesh owns 2/15 of the shares of a company. He sells 1/3 of his shares for Rs. 75,000/-. What is the total value of the company at that time?

1. Rs. 15,75,800
2. Rs. 16,87,500
3. Rs. 17,75,800
4. Rs. 18,27,500

Question Number : 3 Question Id : 56295478 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

एक कंपनी का मूल्य, विभिन्न निवेशकों के स्वामित्व में इसके शेयरों के कुल मूल्य द्वारा मापा जाता है। राकेश के पास इस कंपनी के शेयरों का 2/15 भाग है। वह अपने शेयरों के 1/3 भाग को रु. 75,000/- में बेच देता है। इस कंपनी का कुल मूल्य उस समय क्या है?

1. रु. 15,75,800
2. रु. 16,87,500
3. रु. 17,75,800
4. रु. 18,27,500

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Question Number : 4 Question Id : 56295479 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

A car has wheels of diameter 36 cm. If it runs at a speed of 60 km/h, then the rotation per minute (RPM) will be closest to ______ .

1. 884
2. 898
3. 906
4. 986

Question Number : 4 Question Id : 56295479 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

एक कार के पहियों का व्यास 36 सेंमी है। यदि यह 60 किमी/घंटे की गति से चलती है तो इसके पहियों का प्रति मिनट रोटेशन (RPM) ________ के निकटतम होगा।

1. 884
2. 898
3. 906
4. 986

Question Number : 5 Question Id : 56295480 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

A cylindrical container of radius 20 cm was filled with water up to 25 cm height. A solid spherical ball of radius 7 cm was then immersed in the water. What would be the approximate increase in water level in the container after the ball was fully immersed?

1. 1.14 cm
2. 2.28 cm
3. 5.50 cm
4. 7.00 cm

Question Number : 5 Question Id : 56295480 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

एक बेलनाकार पात्र जिसकी त्रिज्या 20 सेंमी है में 25 सेंमी ऊंचाई तक जल भरा गया। तत्पश्चात इसमें 7 सेंमी त्रिज्या के एक ठोस गोलाकार गेंद को डाला गया। इस गेंद के पानी में पूरी तरह डूबने के पश्चात पात्र में जल के स्तर में लगभग कितनी वृद्धि होगी?

1. 1.14 सेंमी
2. 2.28 सेंमी
3. 5.50 सेंमी
4. 7.00 सेंमी

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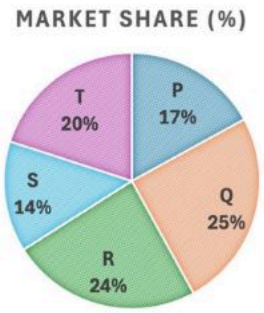
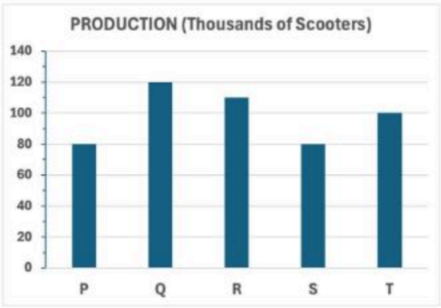
Question Number : 6 Question Id : 56295481 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

The market share (%) and annual production of scooters from five automobile companies P, Q, R, S, and T are shown in graphs.





If the profit of a company is directly proportional to the ratio of market share to production, then which of the following statements is/are CORRECT?

Statement X: Companies T and P have same profit
Statement Y: Company R has the maximum profit
Statement Z: Company S has the minimum profit

1. X and Y
2. X and Z
3. Y and Z
4. Only Z

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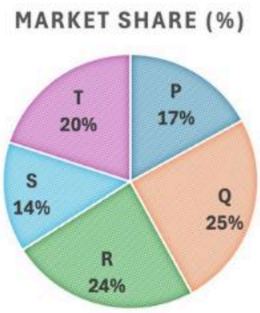
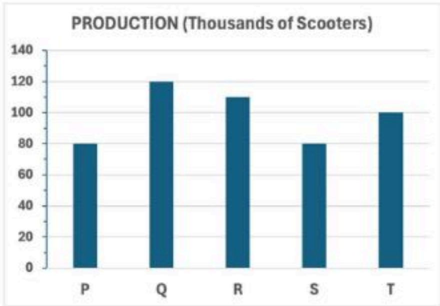
Question Number : 6 Question Id : 56295481 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

नीचे दिए गए ग्राफ में P, Q, R, S और T नामक ऑटोमोबाइल कंपनियों के मार्केट शेयर (%) और स्कूटरों के वार्षिक उत्पादन को प्रदर्शित किया गया है।





यदि किसी कंपनी का लाभ इसके बाजार हिस्सेदारी व उत्पादन के अनुपात के सीधे समानुपाती हो तो निम्नलिखित में से कौन सा/से कथन सही है/हैं ?

कथन X: T और P कंपनी का लाभ एकसमान है
कथन Y: R कंपनी का लाभ सर्वाधिक है
कथन Z: S कंपनी का लाभ न्यूनतम है

1. X एवं Y
2. X एवं Z
3. Y एवं Z
4. केवल Z

Question Number : 7 Question Id : 56295482 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

Rahul and his father started jogging on a circular track of radius ‘r’ (r >2). Rahul completed one round and stopped. His father got tired half way into the first round and returned to his starting point along a straight line. What is the ratio of the distances covered by Rahul and his father?

1. $\pi r / (\pi + 2)$
2. $2\pi / (\pi + 2)$
3. 1
4. 2

Question Number : 7 Question Id : 56295482 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

राहुल और उसके पिता ने ‘r’ (r >2) त्रिज्या के एक वृत्ताकार ट्रैक पर दौड़ना प्रारंभ किया। राहुल ने एक चक्कर पूरा किया और रुक गया। उसके पिता पहले चक्कर के आधे रास्ते पे थक जाने के कारण एक सीधी रेखा में अपने प्रारंभिक बिंदु पर वापस आ गए। पिता के सापेक्ष राहुल द्वारा तय की गई दूरी का अनुपात क्या है?

1. $\pi r / (\pi + 2)$
2. $2\pi / (\pi + 2)$
3. 1
4. 2

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Question Number : 8 Question Id : 56295483 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 2 Wrong Marks : 0.5

Kavita starts from her house and walks 200 m northward, then turns 45° right and walks 70 m. After that, she turns 90° right and walks 70 m. Which of the following is the closest value of the shortest distance between Kavita's current location and her house?

1. 296 m
2. 240 m
3. 200 m
4. 223 m

Question Number : 8 Question Id : 56295483 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 2 Wrong Marks : 0.5

कविता अपने घर से चलना प्रारंभ करती है और 200 मीटर उत्तर की ओर चलती है और उसके बाद 45° पर दाएं मुड़कर 70 मीटर चलती है। तत्पश्चात वह 90° पर दाएं मुड़कर 70 मीटर चलती है। कविता के वर्तमान स्थान और उसके घर के बीच की न्यूनतम दूरी का निकटतम मान निम्नलिखित में से क्या होगा?

1. 296 मीटर
2. 240 मीटर
3. 200 मीटर
4. 223 मीटर

Question Number : 9 Question Id : 56295484 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 2 Wrong Marks : 0.5

The initial monthly salaries of employees John, Riya, and Sunil were in the proportion 4:3:5. After an increase of Rs 10000 monthly to all, the new proportion becomes 6:5:7. What was the initial salary of Sunil?

1. Rs 20000
2. Rs 25000
3. Rs 30000
4. Rs 35000

Question Number : 9 Question Id : 56295484 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 2 Wrong Marks : 0.5

जॉन, रिया और सुनील नामक कर्मचारियों के प्रारंभिक मासिक वेतन का अनुपात 4:3:5 है। सबके वेतन में रु. 10000 की वृद्धि होने पर नया अनुपात 6:5:7 हो जाता है। तो सुनील का प्रारंभिक वेतन क्या था?

1. रु. 20000
2. रु. 25000
3. रु. 30000
4. रु. 35000

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Question Number : 10 Question Id : 56295485 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

Numbers of Rose, Lotus, and Marigold plants in a garden are in the proportion 8:5:7. Later, 75%, 40% and 50% more plants of their respective categories were added. What will be the new proportion of plants, in the same order?

1. 5:3:4
2. 4:2:3
3. 5:4:3
4. 7:4:5

Question Number : 10 Question Id : 56295485 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

एक बगीचे में गुलाब, कमल और गेंदा के पौधों की संख्या का अनुपात 8:5:7 है। बाद में उनकी श्रेणी के क्रमश 75%, 40% और 50% और पौधों को शामिल किया गया। उसी क्रम में पौधों का नया अनुपात क्या होगा?

1. 5:3:4
2. 4:2:3
3. 5:4:3
4. 7:4:5

Question Number : 11 Question Id : 56295486 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

What will be the digit at the unit's place of $1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 + 7^3 + 8^3 + 9^3$?

1. 0
2. 5
3. 7
4. 9

Question Number : 11 Question Id : 56295486 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

$1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 + 7^3 + 8^3 + 9^3$ के इकाई स्थान पर क्या आएगा?

1. 0
2. 5
3. 7
4. 9

Question Number : 12 Question Id : 56295487 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

Suresh asked Ramesh to identify the person in a photo that the latter is holding. Ramesh responds, "I have no brothers or sisters. However, that man's father is my father's son." Who is the person in the photo?

1. Suresh
2. Ramesh
3. Ramesh's son
4. Ramesh's cousin

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Question Number : 12 Question Id : 56295487 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

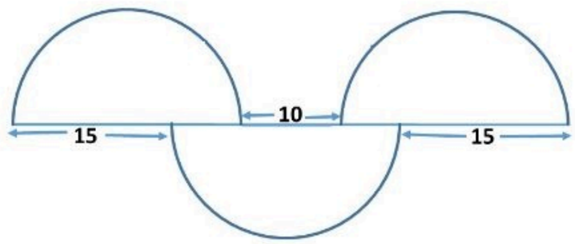
सुरेश ने रमेश से रमेश के पास स्थित फोटो में दिख रहे व्यक्ति की पहचान करने को कहा। रमेश ने कहा कि “मेरा कोई भी भाई या बहिन नहीं है। हालांकि उस व्यक्ति का पिता मेरे पिता का पुत्र है।” फोटो में दिख रहा व्यक्ति कौन है ?

1. सुरेश
2. रमेश
3. रमेश का पुत्र
4. रमेश का चचेरा भाई

Question Number : 13 Question Id : 56295488 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

Three identical semi-circles are arranged as shown. What is the diameter of the semi-circles?

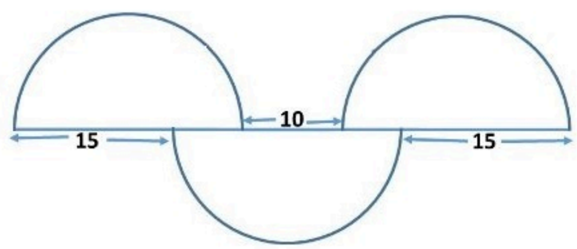


1. 5 π
2. 20
3. 15π /2
4. 25

Question Number : 13 Question Id : 56295488 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

तीन समान अर्ध-वृत्तों को दर्शाए गए क्रम में रखा गया है। अर्ध-वृत्तों का व्यास क्या होगा?



1. 5 π
2. 20
3. 15π /2
4. 25

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Question Number : 14 Question Id : 56295489 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

A number is mistakenly divided by 2 instead of being multiplied by 2. What is the change in the result caused by this mistake?

1. 25%
2. 50%
3. 75%
4. 100%

Question Number : 14 Question Id : 56295489 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

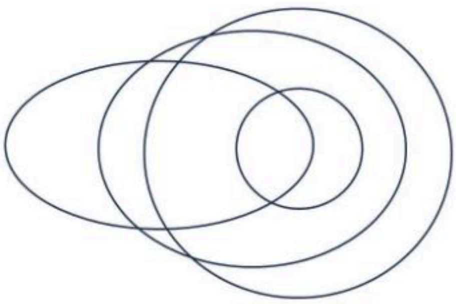
एक संख्या को 2 से गुणा करने के बजाय गलती से 2 से भाग दे दिया गया। इस गलती से परिणाम में कितना परिवर्तन होगा?

1. 25%
2. 50%
3. 75%
4. 100%

Question Number : 15 Question Id : 56295490 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

The following diagram represents the relationship between four categories.



The categories could be

1. Rivers, water bodies, oceans, sources of evaporation
2. Parliamentarians, celebrities, elected persons, professional politicians
3. Monkeys, four-legged animals, pet animals, land animals
4. Furniture, chairs, seats, wooden objects

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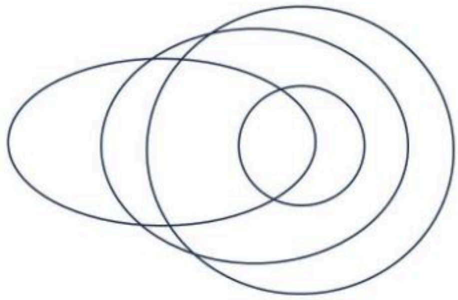
Question Number : 15 Question Id : 56295490 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

नीचे दिए गए चित्र में चार श्रेणियों के बीच संबंध को अभिव्यक्त किया गया है।



ये श्रेणियां हो सकती हैं

1. नदियां, जल निकाय, सागर, वाष्पीकरण के स्रोत
2. सांसद, प्रसिद्ध व्यक्ति, निर्वाचित व्यक्ति, पेशेवर राजनीतिज्ञ
3. बंदर, चार पांव वाले पशु, पालतू पशु, भू पर रहने वाले पशु
4. फर्नीचर, कुर्सियां, सीट, लकड़ी का सामान

Question Number : 16 Question Id : 56295491 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

In a code, the word DELTOID is written as 3152893. Then LOTION could be written as

1. 582986
2. 582981
3. 198396
4. 198392

Question Number : 16 Question Id : 56295491 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

एक कोड भाषा में DELTOID शब्द को 3152893 में लिखा गया है तो LOTION शब्द को कैसे लिखा जाएगा ?

1. 582986
2. 582981
3. 198396
4. 198392

Question Number : 17 Question Id : 56295492 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

Sum of the digits of a two-digit number 'ab' is subtracted from the number and the result is divided by 9. Then the result of this will be

1. always a
2. always b
3. neither a nor b
4. either a or b depending on a+b

Question Number : 17 Question Id : 56295492 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

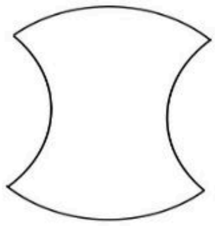
दो अंकों की संख्या 'ab' से इसके अंकों के योग को घटा कर प्राप्त अंक को 9 से विभाजित किया गया। इसका परिणाम होगा

1. सदैव a
2. सदैव b
3. न तो a और न b
4. या तो a या b जो a+b पर निर्भर करेगा

Question Number : 18 Question Id : 56295493 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

A circle of radius 1 unit is divided into four quarters and rejoined as shown below.



What is the area of this shape?

1. π
2. 1
3. 2
4. 4

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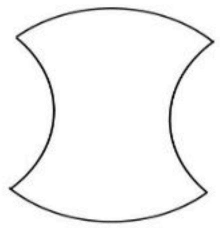
Question Number : 18 Question Id : 56295493 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

एक इकाई वाली त्रिज्या के एक वृत्त को चार एक-चौथाई हिस्सों में विभाजित करके नीचे दर्शाए गए रूप में पुन: जोड़ा गया।



इस आकार का क्षेत्रफल क्या होगा ?

1. π
2. 1
3. 2
4. 4

Question Number : 19 Question Id : 56295494 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

A stock market trader has lost two thirds of her investment on a day. Next day she recovered one third of the previous day's loss. What fraction of her initial investment is she left with?

1. $\frac{1}{3}$
2. $\frac{2}{3}$
3. $\frac{2}{9}$
4. $\frac{5}{9}$

Question Number : 19 Question Id : 56295494 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

एक स्टॉक मार्केट व्यापारी को एक दिन अपने निवेश के दो तिहाई भाग का नुकसान हुआ। अगले दिन उसने अपने पहले दिन के नुकसान के एक तिहाई भाग की भरपाई (पुनर्प्राप्ति) कर ली। उसके प्रारंभिक निवेश का कितना भाग उसके पास बचा?

1. $\frac{1}{3}$
2. $\frac{2}{3}$
3. $\frac{2}{9}$
4. $\frac{5}{9}$

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Question Number : 20 Question Id : 56295495 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

Three friends, Mr. Rahman, Mr. George and Mr. Vedant, met after a long time.

They were wearing red, green and violet colour shirts. Mr. Rahman and the person wearing violet shirt noticed that none of the three is wearing a colour that starts with same letter as his name. Which one of the following is the correct match of the persons with the colour of their shirts?

1. Rahman-Violet, George-Red, Vedant-Green
2. Rahman-Green, George-Violet, Vedant-Red
3. Rahman-Green, George-Red, Vedant-Violet
4. Rahman-Red, George-Violet, Vedant-Green

Question Number : 20 Question Id : 56295495 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 2 Wrong Marks : 0.5

Mr. Rahman, Mr. George and Mr. Vedant नाम के तीन मित्र बहुत लंबे समय पश्चात मिले। वे लाल (red), हरी (green) और बैंगनी (violet) रंग की कमीजें पहने हुए थे। Mr. Rahman और बैंगनी कमीज पहने व्यक्ति ने देखा कि उन तीन में से किसी ने भी उस रंग की कमीज नहीं पहनी है जो कि उनके नाम के पहले अक्षर से मिलती है। निम्नलिखित में से कौन सा कथन व्यक्तियों के नामों का उनकी कमीज के रंग से सही मेल को बताता है?

1. Rahaman-Violet, George-Red, Vedant-Green
2. Rahaman-Green, George-Violet, Vedant-Red
3. Rahaman-Green, George-Red, Vedant-Violet
4. Rahaman-Red, George-Violet, Vedant-Green

PART - B

Section Id :	5629545
Section Number :	2
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	40
Number of Questions to be attempted :	25
Section Marks :	75
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	5629545
Question Shuffling Allowed :	Yes

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Question Number : 21 Question Id : 56295496 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

Let p, q be non-negative integers. Consider the following statements:

(A) There is an integer $k \geq 1$ such that

$$p + k = q.$$

(B) There is an integer $k \geq 1$ such that

$$q + k = p.$$

Which of the following statements is true?

1. There exist non-negative integers p, q such that both (A) and (B) are true.
2. Both (A) and (B) are false if and only if $p = q$.
3. For all non-negative integers p and q, (A) or (B) is true.
4. There exists $p \neq q$ such that both (A) and (B) are false.

Question Number : 21 Question Id : 56295496 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

मानें कि p, q ऋणेतर पूर्णांक हैं। निम्न वक्तव्यों पर विचार करें:

(A) ऐसा कोई पूर्णांक $k \geq 1$ है कि

$$p + k = q.$$

(B) ऐसा कोई पूर्णांक $k \geq 1$ है कि

$$q + k = p.$$

निम्न में से कौन सा वक्तव्य सत्य है?

1. ऐसे ऋणेतर पूर्णांक p, q हैं कि (A) तथा (B) दोनों सत्य हैं।
2. (A) तथा (B) दोनों असत्य हैं, यदि और केवल यदि $p = q$ है।
3. किन्हीं भी ऋणेतर पूर्णांकों p, q के लिए, (A) या (B) सत्य होगा।
4. ऐसे $p \neq q$ हैं कि (A) और (B) दोनों असत्य होंगे।

Question Number : 22 Question Id : 56295497 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let

$$\begin{aligned} A &= \left\{ \frac{p}{q} \in (0,1) \ : \ p \in \mathbb{N},\ q = 2^n \text{ for some } n \in \mathbb{N} \cup \{0\},\ \gcd(p,q) = 1 \right\}, \\ B &= \left\{ \frac{p}{q} \in (0,1) \ : \ p \in \mathbb{N},\ q = 2^n 5^m \text{ for some } n, m \in \mathbb{N} \cup \{0\},\ \gcd(p,q) = 1 \right\}, \\ C &= \left\{ \frac{p}{q} \in (0,1) \ : \ \frac{p}{q} \text{ has terminating decimal expansion } \right\} \end{aligned}$$

be subsets of $(0,1)$. Which of the following statements is true?

1. $A \subsetneqq C$ and $B \subsetneqq C$
2. $A \subsetneqq C \subsetneqq B$
3. $A \subsetneqq B \subsetneqq C$
4. $A \subsetneqq B = C$

Question Number : 22 Question Id : 56295497 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि

$$A = \left\{ \frac{p}{q} \in (0,1) : p \in \mathbb{N},\ q = 2^n \text{ किसी } n \in \mathbb{N} \cup \{0\} \text{ के लिए, } \gcd(p,q) = 1 \right\},$$

$$B = \left\{ \frac{p}{q} \in (0,1) : p \in \mathbb{N},\ q = 2^n 5^m \text{ किन्हीं } n, m \in \mathbb{N} \cup \{0\} \text{ के लिए, } \gcd(p,q) = 1 \right\},$$

$$C = \left\{ \frac{p}{q} \in (0,1) : \frac{p}{q} \text{ का दशमलव प्रसार सांत है} \right\},$$

$(0,1)$ के उपसमुच्चय हैं। निम्न में से कौन सा वक्तव्य सत्य है?

1. $A \subsetneqq C$ तथा $B \subsetneqq C$
2. $A \subsetneqq C \subsetneqq B$
3. $A \subsetneqq B \subsetneqq C$
4. $A \subsetneqq B = C$.

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Question Number : 23 Question Id : 56295498 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let A, B be non-empty subsets of $\mathbb{N}$ with cardinality $|A| \geq 2$. Let

$$S_1 = \{f : A \to B \mid f \text{ is one-to-one}\} \quad \text{and} \quad S_2 = \{g : B \to A \mid g \text{ is onto}\}.$$

Which of the following statements is true?

1. If $A \subsetneq B$ and B is finite, then there is a one-to-one map from S_2 to S_1.
2. If $B = \mathbb{N}$, then there exists a one-to-one map from S_2 to B.
3. If $B = \mathbb{N}$ and A is finite, then there exists a one-to-one map from B to S_1.
4. If A is finite, then S_2 is finite for any B.

Question Number : 23 Question Id : 56295498 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

$\mathbb{N}$ के अरिक्त उपसमुच्चय A, B लें जहाँ गणन संख्या $|A| \geq 2$ है। मानें कि

$S_1 = \left\{f : A \to B \mid f \text{ एकैक है}\right\}$ तथा $S_2 = \left\{g : B \to A \mid g \text{ आच्छादक है}\right\}$.

निम्न में से कौन सा वक्तव्य सत्य है?

1. यदि $A \subsetneq B$ तथा B परिमित है, तब S_2 से S_1 को एकैकी प्रतिचित्र होगा।
2. यदि $B = \mathbb{N}$, तब S_2 से B को एकैकी प्रतिचित्र होगा।
3. यदि $B = \mathbb{N}$ तथा A परिमित है, तब B से S_1 को एकैकी प्रतिचित्र होगा।
4. यदि A परिमित है, तब किसी भी B के लिए S_2 परिमित है।

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Question Number : 24 Question Id : 56295499 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let $f : \mathbb{R} \setminus \mathbb{Q} \to \mathbb{R} \setminus \mathbb{Q}$ be the function defined as

$$f(x) = \frac{3x+2}{4x+3}.$$

Let $x_1 \in \mathbb{R} \setminus \mathbb{Q}$. For $n \geq 1$, define $x_{n+1} = f(x_n)$. Suppose that the sequence $(x_n)_{n\geq 1}$ converges to a real number ℓ. Which of the following statements is true?

1. If ℓ is positive, then $\ell = \frac{\sqrt{3}}{2}$.
2. If ℓ is positive, then $\ell = \frac{1}{\sqrt{2}}$.
3. If ℓ is negative, then $\ell = -\frac{\sqrt{3}}{2}$.
4. If ℓ is negative, then $\ell = -\frac{1}{2}$.

Question Number : 24 Question Id : 56295499 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि फलन $f: \mathbb{R}\setminus\mathbb{Q} \to \mathbb{R}\setminus\mathbb{Q}$ निम्न द्वारा परिभाषित है

$$f(x) = \frac{3x+2}{4x+3}.$$

मानें कि $x_1 \in \mathbb{R}\setminus\mathbb{Q}$. तब $n \geq 1$ के लिए $x_{n+1} = f(x_n)$ परिभाषित करें। मानें कि अनुक्र $(x_n)_{n\geq 1}$ किसी वास्तविक संख्या ℓ पर अभिसरित होता है। निम्न में से कौन सा वक्तव्य सत्य है?

1. यदि ℓ धनात्मक है, तब $\ell = \frac{\sqrt{3}}{2}$.
2. यदि ℓ धनात्मक है, तब $\ell = \frac{1}{\sqrt{2}}$.
3. यदि ℓ ऋणात्मक है, तब$\ell = -\frac{\sqrt{3}}{2}$.
4. यदि ℓ ऋणात्मक है, तब $\ell = -\frac{1}{2}$.

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Question Number : 25 Question Id : 562954100 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let

$$f(x) = x \log_e \left(1 + \frac{1}{x}\right)$$

for $x \in (0, \infty)$. Which of the following statements is true?

1. f is unbounded.
2. f is increasing.
3. $\lim_{x \to \infty} f(x) = 2$.
4. f is decreasing.

Question Number : 25 Question Id : 562954100 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि $x \in (0, \infty)$ के लिए

$$f(x) = x \log_e \left(1 + \frac{1}{x}\right).$$

निम्न में से कौन सा वक्तव्य सत्य है?

1. f अपरिबद्ध है।
2. f वर्धमान है।
3. $\lim_{x \to \infty} f(x) = 2$
4. f ह्रासमान है।

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Question Number : 26 Question Id : 562954101 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

For each $n \geq 1$, let $f_n : [0,1] \to \mathbb{R}$ be defined as

$$f_n(x) = \begin{cases} nx & \text{if } x \in \left[0, \frac{1}{n}\right], \\ 2 - nx & \text{if } x \in \left(\frac{1}{n}, \frac{2}{n}\right], \\ 0 & \text{if } x \in \left(\frac{2}{n}, 1\right]. \end{cases}$$

Which of the following statements is true?

1. $(f_n)_{n\geq 1}$ converges uniformly on $[0,1]$ to a continuous function f.
2. $(f_n)_{n\geq 1}$ converges pointwise on $[0,1]$ to a discontinuous function f.
3. $(f_n)_{n\geq 1}$ converges pointwise on $[0,1]$ to a continuous function f.
4. $(f_n)_{n\geq 1}$ does not converge pointwise on $[0,1]$.

Question Number : 26 Question Id : 562954101 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

प्रत्येक $n \geq 1$ के लिए, मानें कि $f_n : [0,1] \to \mathbb{R}$ निम्नवत् परिभाषित है

$$f_n(x) = \begin{cases} nx & \text{यदि } x \in \left[0, \frac{1}{n}\right], \\ 2 - nx & \text{यदि } x \in (\frac{1}{n}, \frac{2}{n}], \\ 0 & \text{यदि } x \in (\frac{2}{n}, 1]. \end{cases}$$

निम्न में से कौन सा वक्तव्य सत्य है?

1. $(f_n)_{n\geq 1}$ अंतराल $[0,1]$ में एक सतत फलन f पर एकसमानत: अभिसरित होता है।
2. $(f_n)_{n\geq 1}$ अंतराल $[0,1]$ में एक असतत फलन f पर बिंदुवार अभिसरित होता है।
3. $(f_n)_{n\geq 1}$ अंतराल $[0,1]$ में एक सतत फलन f पर बिंदुवार अभिसरित होता है।
4. $(f_n)_{n\geq 1}$ अंतराल $[0,1]$ में बिंदुवार अभिसरित नहीं होता है।

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Question Number : 27 Question Id : 562954102 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

Which of the following polynomials is the characteristic polynomial of a real 2×2 matrix A such that $\mathrm{trace}(A) = 7$ and $\mathrm{trace}(A^2) = 29$?

1. $t^2 + 7t + 10$
2. $t^2 - 7t + 29$
3. $t^2 - 7t - 10$
4. $t^2 - 7t + 10$

Question Number : 27 Question Id : 562954102 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

निम्न में से कौन सा बहुपद एक ऐसे 2×2 आव्यूह A का अभिलक्षणिक बहुपद है जहाँ trace$(A) = 7$ तथा trace$(A^2) = 29$?

1. $t^2 + 7t + 10$
2. $t^2 - 7t + 29$
3. $t^2 - 7t - 10$
4. $t^2 - 7t + 10$

Question Number : 28 Question Id : 562954103 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

Let $\mathbb{F}_5$ denote the field with 5 elements. How many 2×2 matrices with entries in $\mathbb{F}_5$ have rank one?

1. 125
2. 144
3. 145
4. 480

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Question Number : 28 Question Id : 562954103 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

मानें कि $\mathbb{F}_5$ पांच अवयवों का क्षेत्र (field) इंगित करता है। $\mathbb{F}_5$ में प्रविष्टि वाले कितने 2×2 आव्यूहों की कोटि (rank) एक है?

1. 125
2. 144
3. 145
4. 480

Question Number : 29 Question Id : 562954104 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

Let X be the $\mathbb{R}$-vector space of all twice differentiable real valued functions on $[0,1]$. Consider the linear map $\phi : X \to \mathbb{R}^3$ defined by $\phi(f) = (f(1), f'(1), f''(1))$. Which of the following statements is true?

1. The dimension of $X/\ker\phi$ is 3.
2. $\ker\phi$ is finite dimensional.
3. The dimension of $X/\ker\phi$ is 1.
4. X is finite dimensional.

Question Number : 29 Question Id : 562954104 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

$[0,1]$ पर वास्तविक मानों वाले सभी द्वि-अवकलनीय फलनों के $\mathbb{R}$-सदिश समष्टि को X मानें। $\phi(f) = (f(1), f'(1), f''(1))$ से परिभाषित रैखिक प्रतिचित्र $\phi : X \to \mathbb{R}^3$ पर विचार करें। निम्न में से कौन सा वक्तव्य सत्य है?

1. $X/\ker\phi$ की विमा 3 है।
2. $\ker\phi$ परिमित विमीय है।
3. $X/\ker\phi$ की विमा 1 है।
4. X परिमित विमीय है।

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Question Number : 30 Question Id : 562954105 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Consider the real matrix $A = \begin{pmatrix} 29 & 0 & 55 & 17 \\ 1 & 28 & 46 & 26 \\ 17 & 13 & 33 & 38 \\ 21 & 67 & 0 & 13 \end{pmatrix}$. What is the largest real eigenvalue of A?

1. 101
2. 67
3. 103
4. 113

Question Number : 30 Question Id : 562954105 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

वास्तविक आव्यूह $A = \begin{pmatrix} 29 & 0 & 55 & 17 \\ 1 & 28 & 46 & 26 \\ 17 & 13 & 33 & 38 \\ 21 & 67 & 0 & 13 \end{pmatrix}$ पर विचार करें। A का महत्तम वास्तविक अभिलक्षणिक मान क्या है?

1. 101
2. 67
3. 103
4. 113

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Question Number : 31 Question Id : 562954106 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let $C[0,\pi]$ be the real vector space of real-valued continuous functions on the closed interval $[0,\pi]$. For positive integers n, define $f_n \in C[0,\pi]$ by

$$f_n(x) = \begin{cases} \frac{\sin(nx)}{\sin x} & \text{if } x \in (0,\pi), \\ n & \text{if } x = 0, \\ (-1)^{n-1}n & \text{if } x = \pi. \end{cases}$$

Let V be the real subspace of $C[0,\pi]$ spanned by $\{f_1, f_2, f_3\}$. Consider the inner product on V given by

$$\langle f, g\rangle = \frac{2}{\pi}\int_0^{\pi} f(x)g(x)\sin^2 x dx.$$

Which of the following statements is true?

1. $f_4 \in V$
2. $\{f_1, f_2, f_3\}$ is an orthonormal basis of V.
3. The dimension of V is 2.
4. $\{f_1, f_2, f_3\}$ is an orthogonal set but not orthonormal.

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Question Number : 31 Question Id : 562954106 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

संवृत अंतराल $[0, \pi]$ पर वास्तविक मान वाले सतत फलनों की वास्तविक सदिश समष्टि को $C[0, \pi]$ से निर्देशित करें। धनात्मक पूर्णांकों n के लिए, $f_n \in C[0, \pi]$ को निम्न से परिभाषित करें

$$f_n(x) = \begin{cases} \frac{\sin(nx)}{\sin x} & \text{यदि } x \in (0, \pi), \\ n & \text{यदि } x = 0, \\ (-1)^{n-1} n & \text{यदि } x = \pi. \end{cases}$$

V को $\{f_1, f_2, f_3\}$ से विस्तृत $C[0, \pi]$ की उपसमष्टि मानें। V पर निम्न आंतर-गुणनफल लें

$$\langle f, g \rangle = \frac{2}{\pi} \int_0^\pi f(x) g(x) \sin^2 x dx.$$

निम्न में से कौन सा वक्तव्य सत्य है?

1. $f_4 \in V$
2. $\{f_1, f_2, f_3\}$ यहां V का प्रसामान्य लांबिक आधार है।
3. V की विमा 2 है।
4. $\{f_1, f_2, f_3\}$ एक लांबिक समुच्चय है लेकिन प्रसामान्य लांबिक नहीं है।

Question Number : 32 Question Id : 562954107 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let $V = \{ax^3 + bx^2 + cx \mid a, b, c \in \mathbb{R}\}$. For $f \in V$, define

$$Q(f) = \int_{-1}^{1} (f'(t))^2 \mathrm{d}t,$$

where f' denotes the derivative of f. Which of the following statements is **FALSE**?

1. Q is a positive definite quadratic form on V.
2. Q takes every positive real value.
3. $Q(x) = 2$.
4. For all $f, g \in V$, $Q(f + g) = Q(f) + Q(g)$.

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Question Number : 32 Question Id : 562954107 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि $V = \{ax^3 + bx^2 + cx \mid a, b, c \in \mathbb{R}\}$. किसी भी $f \in V$ के लिए, निम्न परिभाषा लें

$$Q(f) = \int_{-1}^{1} (f'(t))^2 dt,$$

जहां f' द्वारा f के अवकलज को इंगित करते हैं। निम्न में से कौन सा वक्तव्य **असत्य** है?

1. Q यहां V पर धनात्मक निश्चित द्विघाती समघात है।
2. Q प्रत्येक धनात्मक वास्तविक मान लेता है।
3. $Q(x) = 2.$
4. सभी $f, g \in V$ के लिए, $Q(f + g) = Q(f) + Q(g).$

Question Number : 33 Question Id : 562954108 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let $f : \mathbb{C} \to \mathbb{C}$ be a polynomial map. For $R > 0$, let $\gamma_R : [0, 1] \to \mathbb{C}$ be the map $t \mapsto Re^{2\pi it}$. Suppose that there exists $c \in \mathbb{R}$ such that

$$\int_0^1 |(f \circ \gamma_R)(t)\gamma_R'(t)| \, \mathrm{d}t \longrightarrow c \text{ as } R \longrightarrow \infty.$$

Which of the following statements is **FALSE**?

1. The function $zf(1/z) \longrightarrow 0$ as $|z| \longrightarrow \infty$.
2. The function f is constant.
3. $c = 0.$
4. $c > 0.$

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Question Number : 33 Question Id : 562954108 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

एक बहुपद प्रतिचित्र $f\colon \mathbb{C} \to \mathbb{C}$ लें। $R > 0$ के लिए मानें कि $\gamma_R : [0,1] \to \mathbb{C}$ प्रतिचित्र $t \mapsto Re^{2\pi i t}$ है। मानें कि ऐसा $c \in \mathbb{R}$ है, जिससे कि

$$\int_0^1 |(f \circ \gamma_R)(t)\gamma_R'(t)|\, dt \longrightarrow c \text{ जब } R \longrightarrow \infty.$$

निम्न में से कौन सा वक्तव्य **असत्य** है?

1. फलन $zf(1/z) \longrightarrow 0$ जब $|z| \longrightarrow \infty$.
2. फलन f अचर है।
3. $c = 0.$
4. $c > 0.$

Question Number : 34 Question Id : 562954109 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

Let X be the image of the interval $[0,1]$ under the Möbius transformation $f(z) = \dfrac{z-i}{z+i}$.
Which of the following statements is true?

1. X is the line segment joining -1 and $-i$.
2. $X = \left\{e^{i\theta} \mid \theta \in \left[\pi, \frac{3\pi}{2}\right]\right\}$.
3. X is the line segment joining -1 to 1.
4. $X = \left\{e^{i\theta} \mid \theta \in \left[-\frac{\pi}{2}, \pi\right]\right\}$.

Question Number : 34 Question Id : 562954109 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

मानें कि मोबियस रूपांतरण $f(z) = \dfrac{z-i}{z+i}$ के अंतर्गत X अंतराल $[0,1]$ का प्रतिबिंब है। निम्न में से कौन सा वक्तव्य सत्य है?

1. X वह रेखाखंड है जो -1 तथा $-i$ को जोड़ता है।
2. $X = \{e^{i\theta} \mid \theta \in [\pi, \frac{3\pi}{2}]\}$.
3. X वह रेखाखंड है जो -1 से 1 को जोड़ता है।
4. $X = \{e^{i\theta} \mid \theta \in [-\frac{\pi}{2}, \pi]\}$.

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Question Number : 35 Question Id : 562954110 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Which of the following statements is true?

1. There exists an entire function f such that $f^{(n)}(0) = \frac{n!}{n^n}$ for all positive integers n.
2. There exists an entire function f such that $f^{(n)}(0) = n!n^n$ for all positive integers n.
3. There exists an entire function f such that $f^{(n)}(0) = (n-1)!$ for all positive integers n.
4. There exists an entire function f such that $f^{(n)}(0) = n!n$ for all positive integers n.

Question Number : 35 Question Id : 562954110 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

निम्न में से कौन सा वक्तव्य सत्य है?

1. ऐसा कोई सर्वत्र वैश्लेषिक फलन f है कि सभी धनात्मक पूर्णांकों n के लिए $f^{(n)}(0) = \frac{n!}{n^n}$.
2. ऐसा कोई सर्वत्र वैश्लेषिक फलन f है कि सभी धनात्मक पूर्णांकों n के लिए $f^{(n)}(0) = n!n^n$.
3. ऐसा कोई सर्वत्र वैश्लेषिक फलन f है कि सभी धनात्मक पूर्णांकों n के लिए $f^{(n)}(0) = (n-1)!$.
4. ऐसा कोई सर्वत्र वैश्लेषिक फलन f है कि सभी धनात्मक पूर्णांकों n के लिए $f^{(n)}(0) = n!n$.

Question Number : 36 Question Id : 562954111 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let f be an entire function such that $f(\mathbb{C}) \subset \{x+iy \mid y = x+1\}$. Which of the following statements is true?

1. $|f(z)| \to \infty$ as $|z| \to \infty$.
2. $\dfrac{f(z)}{z} \to 0$ as $|z| \to \infty$.
3. $zf(z) \to 0$ as $|z| \to \infty$.
4. $f(z) \to 0$ as $|z| \to \infty$.

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Question Number : 36 Question Id : 562954111 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

मानें कि f ऐसा सर्वत्र वैश्लेषिक फलन है कि $f(\mathbb{C}) \subset \{x + iy \mid y = x + 1\}$. निम्न में से कौन सा वक्तव्य सत्य है?

1. $|f(z)| \to \infty$ जब $|z| \to \infty$.
2. $\frac{f(z)}{z} \to 0$ जब $|z| \to \infty$.
3. $zf(z) \to 0$ जब $|z| \to \infty$.
4. $f(z) \to 0$ जब $|z| \to \infty$.

Question Number : 37 Question Id : 562954112 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

Which of the following statements is true?

1. $p \nmid 1 + (p-1)!$ for some odd prime p.
2. $p \mid (1234)^{p-1} - 1$ for all primes $p > 700$.
3. There exist $a \in \mathbb{Z}$ and a prime $p > 11$ such that $p \nmid a^p - a$.
4. $p \nmid \frac{(p^2)!}{(p!)^2}$ for some odd prime p.

Question Number : 37 Question Id : 562954112 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

निम्न में से कौन सा वक्तव्य सत्य है?

1. ऐसा विषम अभाज्य p है जिसके लिए $p \nmid 1 + (p-1)!$.
2. सभी अभाज्य $p > 700$ के लिए $p \mid (1234)^{p-1} - 1$.
3. ऐसे $a \in \mathbb{Z}$ तथा अभाज्य $p > 11$ हैं कि $p \nmid a^p - a$.
4. ऐसा विषम अभाज्य p है जिसके लिए $p \nmid \frac{(p^2)!}{(p!)^2}$.

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Question Number : 38 Question Id : 562954113 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let A be a subring of the field of rationals $\mathbb{Q}$ such that for any nonzero rational $r \in \mathbb{Q}$, $r \in A$ or $1/r \in A$. Which of the following statements is **FALSE**?

1. The set $\left\{a \in A : \frac{1}{a} \notin A\right\} \cup \{0\}$ is an additive subgroup of $\mathbb{Q}$.
2. A has at most one maximal ideal.
3. If $A \neq \mathbb{Q}$, then A has infinitely many prime ideals.
4. For any nonzero $a, b \in A$, a divides b or b divides a in A.

Question Number : 38 Question Id : 562954113 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि परिमेय संख्याओं के क्षेत्र (field) $\mathbb{Q}$ का उपवलय A इस प्रकार है कि किसी भी शून्येतर परिमेय $r\in \mathbb{Q}$ के लिए $r \in A$ या $1/r \in A$, तो निम्न में से कौन सा वक्तव्य **असत्य** है?

1. समुच्चय $\left\{a \in A : \frac{1}{a} \notin A\right\} \cup \{0\}$ यहां $\mathbb{Q}$ का योज्य उपसमूह है।
2. A की अधिकतम एक उच्चिष्ठ गुणजावली है।
3. यदि $A \neq \mathbb{Q}$, तब A की अनंत अभाज्य गुणजावलियाँ हैं।
4. किसी भी शून्येतर $a, b \in A$ के लिए, A में, a से b विभाजित होता है या b से a विभाजित होता है ।

Question Number : 39 Question Id : 562954114 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Which of the following statements is true?

1. The ideal $2\mathbb{Z}[i]$ is maximal in $\mathbb{Z}[i]$.
2. The ideal $X\mathbb{C}[X, Y]$ is maximal in $\mathbb{C}[X, Y]$.
3. The set of all polynomials in $\mathbb{C}[X]$ whose coefficients add up to 0 is a maximal ideal in $\mathbb{C}[X]$.
4. The ideal $(\sqrt{2} - 1)\mathbb{Z}[\sqrt{2}]$ is maximal in $\mathbb{Z}[\sqrt{2}]$.

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Question Number : 39 Question Id : 562954114 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

निम्न में से कौन सा वक्तव्य सत्य है?

1. गुणजावली $2\mathbb{Z}[i]$, $\mathbb{Z}[i]$ में उच्चिष्ठ है।
2. गुणजावली $X\mathbb{C}[X,Y]$, $\mathbb{C}[X,Y]$ में उच्चिष्ठ है।
3. $\mathbb{C}[X]$ के ऐसे सभी बहुपदों का समुच्चय जिसके गुणाकों का योग 0 होता है, $\mathbb{C}[X]$ में उच्चिष्ठ गुणजावली है।
4. गुणजावली$(\sqrt{2}-1)\mathbb{Z}[\sqrt{2}]$, $\mathbb{Z}[\sqrt{2}]$ में उच्चिष्ठ है।

Question Number : 40 Question Id : 562954115 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let $S = \{1,2,3,4,5\}$ be equipped with the topology $\tau = \{\emptyset, \{1\}, S\}$. What is the number of homeomorphisms of S onto itself?

1. 25
2. 120
3. 24
4. 6

Question Number : 40 Question Id : 562954115 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

समुच्चय $S = \{1,2,3,4,5\}$ पर सांस्थितिकी $\tau = \{\varnothing, \{1\}, S\}$ लें। S के स्वयं पर आच्छादक समप्रारूपों की संख्या क्या है?

1. 25
2. 120
3. 24
4. 6

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Question Number : 41 Question Id : 562954116 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

If $\varphi(x) = x$ is a solution of the ordinary differential equation (ODE)

$$\frac{d^2y}{dx^2} - \left(\frac{2}{x^2} + \frac{1}{x}\right)\left(x\frac{dy}{dx} - y\right) = 0,\ 0 < x < \infty,$$

then the general solution of the ODE is given by

1. $\left(a + be^{-2x}\right)x,\ a, b \in \mathbb{R}$
2. $\left(a + be^{2x}\right)x,\ a, b \in \mathbb{R}$
3. $ae^{x} + bx,\ a, b \in \mathbb{R}$
4. $\left(a + be^{x}\right)x,\ a, b \in \mathbb{R}$

Question Number : 41 Question Id : 562954116 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

यदि $\varphi(x) = x$ निम्न साधारण अवकलन समीकरण (ODE)

$$\frac{d^2y}{dx^2} - \left(\frac{2}{x^2} + \frac{1}{x}\right)\left(x\frac{dy}{dx} - y\right) = 0,\ 0 < x < \infty,$$

का हल है, तो ODE का व्यापक हल निम्न होगा

1. $\left(a + be^{-2x}\right)x,\ a, b \in \mathbb{R}$
2. $\left(a + be^{2x}\right)x,\ a, b \in \mathbb{R}$
3. $ae^{x} + bx,\ a, b \in \mathbb{R}$
4. $\left(a + be^{x}\right)x,\ a, b \in \mathbb{R}$

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Question Number : 42 Question Id : 562954117 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let $(\lambda_n)_{n\in\mathbb{N}}$ be the sequence of eigenvalues of the Sturm-Liouville problem

$$\frac{d}{dx}\left(x\frac{dy}{dx}\right)+\frac{\lambda}{x}y=0,\ 1<x<e^{2\pi},$$

$$y(1)=0,\ y\left(e^{2\pi}\right)=0.$$

Then $\sum_{n=1}^{\infty}\frac{1}{\lambda_n}$ is equal to

1. $\frac{\pi^2}{12}$
2. $\frac{2\pi^2}{3}$
3. $\frac{\pi^2}{4}$
4. $\frac{\pi^2}{16}$

Question Number : 42 Question Id : 562954117 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि $(\lambda_n)_{n\in\mathbb{N}}$ निम्न स्टर्म-ल्यूविल समस्या के अभिलक्षणिक मानों का अनुक्रम है

$$\frac{d}{dx}\left(x\frac{dy}{dx}\right)+\frac{\lambda}{x}y=0,\ 1<x<e^{2\pi},$$

$$y(1)=0,\ y\left(e^{2\pi}\right)=0.$$

तब $\sum_{n=1}^{\infty}\frac{1}{\lambda_n}$ निम्न के बराबर है

1. $\frac{\pi^2}{12}$
2. $\frac{2\pi^2}{3}$
3. $\frac{\pi^2}{4}$
4. $\frac{\pi^2}{16}$

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Question Number : 43 Question Id : 562954118 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

Let $u = u(x, y)$ be the solution to the Cauchy problem

$$(y+u)\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = x - y, \quad x \in \mathbb{R},\ y > 0,$$
$$u(x,1) = 1 + x, \qquad x \in \mathbb{R}.$$

Then which of the following statements is true?

1. $u(1,1) = 2$
2. $u(2,2) = 4$
3. $u(3,3) = \frac{3}{2}$
4. $u(4,4) = \frac{2}{3}$

Question Number : 43 Question Id : 562954118 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

मानें कि $u = u(x, y)$ निम्न कॉशी समस्या का हल है

$$(y+u)\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = x - y, \quad x \in \mathbb{R},\ y > 0,$$
$$u(x,1) = 1 + x, \qquad x \in \mathbb{R}.$$

तब निम्न में से कौन सा वक्तव्य सत्य है?

1. $u(1,1) = 2$
2. $u(2,2) = 4$
3. $u(3,3) = \frac{3}{2}$
4. $u(4,4) = \frac{2}{3}$

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Question Number : 44 Question Id : 562954119 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

Let $u = u(x,t)$ be the solution of

$$\frac{\partial^2 u}{\partial t^2} - \frac{\partial^2 u}{\partial x^2} = 0,\ x \in \mathbb{R},\ t > 0,$$
$$u(x,0) = 1 + x^2,\ \ x \in \mathbb{R},$$
$$\frac{\partial u}{\partial t}(x,0) = x + 1,\ \ x \in \mathbb{R}.$$

Then the value of $u(1,1)$ is

1. 2
2. 3
3. 4
4. 5

Question Number : 44 Question Id : 562954119 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

मानें कि $u = u(x,t)$ निम्न का हल है

$$\frac{\partial^2 u}{\partial t^2} - \frac{\partial^2 u}{\partial x^2} = 0,\ x \in \mathbb{R}, t > 0,$$
$$u(x,0) = 1 + x^2,\ \ x \in \mathbb{R},$$
$$\frac{\partial u}{\partial t}(x,0) = x + 1,\ \ x \in \mathbb{R}.$$

तब $u(1,1)$ का मान है

1. 2
2. 3
3. 4
4. 5

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Question Number : 45 Question Id : 562954120 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

If the function $s : [0,4] \to \mathbb{R}$ defined by

$$s(x) = \begin{cases} a(x-2)^2 + b(x-1)^2, & 0 \le x \le 1, \\ (x-2)^2, & 1 < x \le 3, \\ 2c(x-2)^2 + (x-3)^3, & 3 < x \le 4 \end{cases}$$

is a cubic spline, then the value of $2a + b + 2c$ is

1. 2
2. 3
3. 4
4. 5

Question Number : 45 Question Id : 562954120 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

यदि निम्न द्वारा परिभाषित फलन $s : [0,4] \to \mathbb{R}$

$$s(x) = \begin{cases} a(x-2)^2 + b(x-1)^2, & 0 \le x \le 1, \\ (x-2)^2, & 1 < x \le 3, \\ 2c(x-2)^2 + (x-3)^3, & 3 < x \le 4 \end{cases}$$

क्यूबिक स्प्लाईन (cubic spline) है, तब $2a + b + 2c$ का मान है

1. 2
2. 3
3. 4
4. 5

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Question Number : 46 Question Id : 562954121 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let $y(x)$ be the extremal of the functional

$$J[y] = \int_0^{\frac{\pi}{4}} \left((y')^2 - 4y^2 + 2xy\right) dx$$

subject to $y(0) = 0$, $y\left(\frac{\pi}{4}\right) = 1$. Then $y(x)$ is equal to

1. $\left(1 - \frac{\pi}{4}\right)\sin(2x) + x$
2. $\left(1 - \frac{\pi}{16}\right)\sin(2x) + \frac{x}{4}$
3. $\left(1 + \frac{\pi}{4}\right)\sin(2x) - x$
4. $\left(1 + \frac{\pi}{16}\right)\sin(2x) - \frac{x}{4}$

Question Number : 46 Question Id : 562954121 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि $y(x)$ निम्न फलनक का चरमक है

$$J[y] = \int_0^{\frac{\pi}{4}} \left((y')^2 - 4y^2 + 2xy\right)\, dx$$

बशर्ते $y(0) = 0$, $y\left(\frac{\pi}{4}\right) = 1$. तब $y(x)$ निम्न के बराबर है

1. $\left(1 - \frac{\pi}{4}\right)\sin(2x) + x$
2. $\left(1 - \frac{\pi}{16}\right)\sin(2x) + \frac{x}{4}$
3. $\left(1 + \frac{\pi}{4}\right)\sin(2x) - x$
4. $\left(1 + \frac{\pi}{16}\right)\sin(2x) - \frac{x}{4}$

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Question Number : 47 Question Id : 562954122 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

If $y(x)$ is the solution of the integral equation

$$y(x) = x^2 + 2\int_0^1 xty(t)\,dt,$$

then which of the following statements is true?

1. $y(0) + y(1) = \frac{1}{2}$
2. $y(-1) + y(1) = 1$
3. $y'(0) + y'(1) = \frac{3}{2}$
4. $y'(-1) + y'(1) = 3$

Question Number : 47 Question Id : 562954122 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

यदि $y(x)$ निम्न समाकल समीकरण का हल है

$$y(x) = x^2 + 2\int_0^1 xty(t)\,dt,$$

तब निम्न में से कौन सा वक्तव्य सत्य है?

1. $y(0) + y(1) = \frac{1}{2}$
2. $y(-1) + y(1) = 1$
3. $y'(0) + y'(1) = \frac{3}{2}$
4. $y'(-1) + y'(1) = 3$

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Question Number : 48 Question Id : 562954123 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Suppose a dynamical system has the Lagrangian

$$L = (\dot{q}_1)^2 + (\dot{q}_2)^2 + (q_1)^2 + \dot{q}_1\dot{q}_2$$

If p_1 and p_2 are momenta conjugate to q_1 and q_2, respectively, then which of the following statements is true?

1. $\dot{p}_1 = 2q_1, \dot{p}_2 = 0$
2. $\dot{p}_1 = -q_1, \dot{p}_2 = 0$
3. $\dot{p}_1 = -\frac{q_1}{2}, p_2 = q_2$
4. $\dot{p}_1 = q_1, p_2 = -q_2$

Question Number : 48 Question Id : 562954123 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि किसी गतिकीय तंत्र के लिए लग्रान्जी निम्न है

$$L = (\dot{q}_1)^2 + (\dot{q}_2)^2 + (q_1)^2 + \dot{q}_1\dot{q}_2$$

यदि p_1 तथा p_2 क्रमशः q_1 तथा q_2, के आघूर्ण संयुग्मी हैं, तब निम्न में से कौन सा वक्तव्य सत्य है?

1. $\dot{p}_1 = 2q_1,\ \dot{p}_2 = 0$
2. $\dot{p}_1 = -q_1,\ \dot{p}_2 = 0$
3. $\dot{p}_1 = -\frac{q_1}{2},\ p_2 = q_2$
4. $\dot{p}_1 = q_1,\ p_2 = -q_2$

Question Number : 49 Question Id : 562954124 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Suppose that we have a data set consisting of $2n + 1$ observations for some $n \in \mathbb{N}$. Value of each observation is either x or $x + r$, where $x \in \mathbb{N}, r \geq 0$. Then, which of the following statements is always true?

1. The mean and median of the data will be different if and only if $r > 0$
2. Variance of the data is positive if and only if $r > 0$
3. Mean and mode of the data will be same if and only if $r = 0$
4. Median and mode of the data will be same for all values of $r \geq 0$

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Question Number : 49 Question Id : 562954124 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

मानें कि हमारे पास किसी $n \in \mathbb{N}$ के लिए $2n+1$ प्रेक्षणों वाले आंकड़ों का एक समुच्चय है। प्रत्येक प्रेक्षण का मान या तो x है या $x+r$ है, जहां $x \in \mathbb{N}$, $r \geq 0$ हैं। तब निम्न में से कौन सा वक्तव्य सर्वदा सत्य है?

1. आंकड़ों के माध्य तथा माध्यिका भिन्न होंगे यदि और केवल यदि $r > 0$ है
2. आंकड़ों का प्रसरण धनात्मक है यदि और केवल यदि $r > 0$ है
3. आंकड़ों के माध्य तथा बहुलक भिन्न होंगे यदि और केवल यदि $r = 0$ है
4. सभी $r \geq 0$ के लिए आंकड़ों के माध्यिका तथा बहुलक एक-समान होंगे

Question Number : 50 Question Id : 562954125 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

A biased six-faced die is tossed once. Suppose that the probability of any prime number showing up is twice that of any non-prime number showing up. Then, the probability that an odd number will show up is

1. $\frac{1}{3}$
2. $\frac{2}{3}$
3. $\frac{4}{9}$
4. $\frac{5}{9}$

Question Number : 50 Question Id : 562954125 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

एक अभिनत छः मुखी पासा एक बार उछाला जाता है। मानें कि किसी अभाज्य अंक के आने की प्रायिकता, किसी अभाज्येतर अंक के आने की प्रायिकता की दोगुनी है। तब, किसी विषम संख्या के आने की प्रायिकता निम्न है

1. $\frac{1}{3}$
2. $\frac{2}{3}$
3. $\frac{4}{9}$
4. $\frac{5}{9}$

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Question Number : 51 Question Id : 562954126 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let $Z_1, Z_2, \ldots$ be a sequence of independent and identically distributed random variables having discrete uniform distribution over $\{1, 2, \ldots, 2024\}$. Let $Y_n = \sum_{i=1}^{n} Z_i,\ n \geq 2$. Further, let X_n be the remainder when Y_n is divided by 2025. Then, which of the following statements is true?

1. $\lim_{n\to\infty} P\left(X_n = 0\right) = \frac{1}{2026}$
2. $\lim_{n\to\infty} P\left(X_n = 0\right) = \frac{1}{2025}$
3. $\lim_{n\to\infty} P\left(X_n = 0\right) = \frac{1}{2024}$
4. $\lim_{n\to\infty} P\left(X_n = 0\right) = \frac{1}{2023}$

Question Number : 51 Question Id : 562954126 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि $\{1, 2, \ldots, 2024\}$ पर $Z_1, Z_2, \ldots$, विविक्त एक-समान बंटन वाले स्वतंत्र एवं सर्वथासमानतः बंटित यादृच्छिक चरों का अनुक्रम है । मानें कि $Y_n = \sum_{i=1}^{n} Z_i,\ n \geq 2$. इसके अतिरिक्त, मानें कि जब Y_n को 2025 से विभाजित करते हैं तो X_n शेष बचता है। तब निम्न में से कौन सा वक्तव्य सत्य है?

1. $\lim_{n\to\infty} P\left(X_n = 0\right) = \frac{1}{2026}$
2. $\lim_{n\to\infty} P\left(X_n = 0\right) = \frac{1}{2025}$
3. $\lim_{n\to\infty} P\left(X_n = 0\right) = \frac{1}{2024}$
4. $\lim_{n\to\infty} P\left(X_n = 0\right) = \frac{1}{2023}$

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Question Number : 52 Question Id : 562954127 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

A mobile manufacturing company uses two brands of batteries for its mobiles. The life (in years) of batteries of Brand I follows an exponential distribution with the probability density function

$$f(x) = \begin{cases} e^{-x}, & \text{if } x > 0, \\ 0, & \text{otherwise,} \end{cases}$$

and that of Brand II follows a gamma distribution with the probability density function

$$g(x) = \begin{cases} \frac{x}{4}e^{-x/2}, & \text{if } x > 0, \\ 0, & \text{otherwise.} \end{cases}$$

The company uses the batteries of Brands I and II in proportion of 20% and 80% respectively, in its mobiles. The probability that a randomly selected mobile has the battery life more that 2 years is

1. $\frac{13}{5}e^{-2}$
2. $\frac{1}{5}(e^{-2} + 2e^{-1})$
3. $\frac{1}{5}(e^{-2} + 8e^{-1})$
4. $\frac{1}{5}(4e^{-2} + 2e^{-1})$

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Question Number : 52 Question Id : 562954127 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

कोई मोबाईल निर्माणकर्ता कंपनी अपने मोबाइल के लिए दो ब्रांड की बैटरी उपयोग करती है। ब्रांड-I की बैटरी का जीवनकाल (वर्षों में) निम्न प्रायिकता घनत्व फलन वाले चरघांताकी बंटन का अनुसरण करता है

$$f(x) = \begin{cases} e^{-x}, & \text{यदि } x > 0, \\ 0, & \text{अन्यथा}, \end{cases}$$

तथा ब्रांड-II निम्न प्रायिकता घनत्व फलन वाले गामा बंटन का अनुसरण करता है

$$g(x) = \begin{cases} \frac{x}{4} e^{-x/2}, & \text{यदि } x > 0, \\ 0, & \text{अन्यथा ।} \end{cases}$$

कंपनी ब्रांड-I तथा ब्रांड-II की बैटरी का क्रमशः 20% तथा 80% के अनुपात में उपयोग करती है। इस बात की प्रायिकता, कि यादृच्छिक चुनी गई बैटरी का जीवनकाल 2 वर्ष से अधिक होगा, निम्न है

1. $\frac{13}{5} e^{-2}$
2. $\frac{1}{5}(e^{-2} + 2e^{-1})$
3. $\frac{1}{5}(e^{-2} + 8e^{-1})$
4. $\frac{1}{5}(4e^{-2} + 2e^{-1})$

Question Number : 53 Question Id : 562954128 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Consider a discrete random variable X with the probability mass function

$$P(X = 0) = \frac{\theta}{3},\ P(X = 1) = 1 - \frac{\theta}{2},\ P(X = 2) = \frac{\theta}{6},$$

where $\theta \in (0, 1)$ is an unknown parameter. In a random sample of size 90 from this distribution, the observed counts for $X = 0, 1$ and 2 are $20, 60$ and 10, respectively. Then, the maximum likelihood estimate of θ is

1. $\frac{1}{3}$
2. $\frac{1}{2}$
3. $\frac{2}{3}$
4. $\frac{3}{4}$

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Question Number : 53 Question Id : 562954128 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

निम्न प्रायिकता द्रव्यमान फलन वाले विविक्त यादृच्छिक चर X पर विचार करें

$$P(X=0)=\frac{\theta}{3},\ P(X=1)=1-\frac{\theta}{2},\ P(X=2)=\frac{\theta}{6},$$

जहाँ $\theta \in (0,1)$ कोई अज्ञात प्राचल है। इस बंटन में से आमाप 90 का यादृच्छिक प्रतिदर्श लेने पर, $X=0,1$ तथा 2 के प्रेक्षित गणन क्रमशः 20, 60 तथा 10 हैं। तब θ का अधिकतम् संभाविता आकलन है

1. $\frac{1}{3}$
2. $\frac{1}{2}$
3. $\frac{2}{3}$
4. $\frac{3}{4}$

Question Number : 54 Question Id : 562954129 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let X be a random sample of size 1 from the probability density function

$$f(x|\theta)=\begin{cases}\frac{3}{\theta^3}(\theta-x)^2, & \text{if } 0<x<\theta,\\ 0, & \text{otherwise.}\end{cases}$$

If $\left(\frac{X}{1-\lambda_1}, \frac{X}{1-\lambda_2}\right)$ is a confidence interval for θ with confidence coefficient $1-\alpha$, where $\lambda_i \in (0,1)$, $i=1,2$, $\lambda_1<\lambda_2$, and $\alpha \in (0,1)$, then which of the following statements is true?

1. $\lambda_2^2-\lambda_1^2=1-\alpha$
2. $\lambda_2^3-\lambda_1^3=1-\alpha$
3. $\lambda_2^2-\lambda_1^2=4(1-\alpha)$
4. $\lambda_2^3-\lambda_1^3=9(1-\alpha)$

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Question Number : 54 Question Id : 562954129 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि X निम्न प्रायिकता घनत्व फलन में से आमाप 1 का यादृच्छिक प्रतिदर्श है

$$f(x|\theta) = \begin{cases} \frac{3}{\theta^3}(\theta - x)^2, & \text{यदि } 0 < x < \theta, \\ 0, & \text{अन्यथा ।} \end{cases}$$

यदि विश्वास्यता गुणांक $1-\alpha$ के लिए, θ का एक विश्वास्यता अंतराल $\left(\frac{X}{1-\lambda_1}, \frac{X}{1-\lambda_2}\right)$ है, जहां $\lambda_i \in (0,1),\ i = 1, 2,\ \lambda_1 < \lambda_2,$ तथा $\alpha \in (0,1),$ तब निम्न में से कौन सा वक्तव्य सत्य है?

1. $\lambda_2^2 - \lambda_1^2 = 1 - \alpha$
2. $\lambda_2^3 - \lambda_1^3 = 1 - \alpha$
3. $\lambda_2^2 - \lambda_1^2 = 4(1 - \alpha)$
4. $\lambda_2^3 - \lambda_1^3 = 9(1 - \alpha)$

Question Number : 55 Question Id : 562954130 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Let $X_1, X_2, \ldots, X_n$ be a random sample from a continuous distribution with the common probability density function

$$f(x|\theta) = \begin{cases} \frac{2^\theta\,\theta}{x^{\theta+1}}, & \text{if } x > 2, \\ 0, & \text{otherwise,} \end{cases}$$

where $\theta\,(> 0)$ is an unknown parameter. Suppose $P(Y > \chi^2_{m,\beta}) = \beta$, where $Y \sim \chi^2_m$. For testing $H_0 : \theta = 1$ against $H_1 : \theta > 1$, a uniformly most powerful test of size α, $0 < \alpha < 1$, will reject H_0 if

1. $\sum_{i=1}^n \ln X_i > \frac{1}{2}\chi^2_{2n,\alpha} + n\ln 2$
2. $\sum_{i=1}^n \ln X_i < \frac{1}{2}\chi^2_{2n,1-\alpha} + n\ln 2$
3. $\sum_{i=1}^n \ln X_i > \chi^2_{n,\alpha} + n\ln 2$
4. $\sum_{i=1}^n \ln X_i < \chi^2_{n,1-\alpha} + n\ln 2$

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Question Number : 55 Question Id : 562954130 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि निम्न सामान्य प्रायिकता बंटन फलन वाले संतत बंटन में से $X_1, X_2, \ldots, X_n$ यादृच्छिक प्रतिदर्श है

$$f(x|\theta) = \begin{cases} \frac{2^{\theta}\,\theta}{x^{\theta+1}}, & \text{यदि } x > 2, \\ 0, & \text{अन्यथा}, \end{cases}$$

जहाँ $\theta\,(> 0)$ कोई अज्ञात प्राचल है। मानें कि $P(Y > \chi^2_{m,\beta}) = \beta$, जहां $Y \sim \chi^2_m$. $H_1 : \theta > 1$ के विरूद्ध $H_0 : \theta = 1$ का परीक्षण करने के लिए, आमाप α, $0 < \alpha < 1$, का एकसमानतः शक्ततम परीक्षण H_0 को अस्वीकार कर देगा, यदि

1. $\sum_{i=1}^{n} \ln X_i > \frac{1}{2}\chi^2_{2n,\alpha} + n \ln 2$
2. $\sum_{i=1}^{n} \ln X_i < \frac{1}{2}\chi^2_{2n,1-\alpha} + n \ln 2$
3. $\sum_{i=1}^{n} \ln X_i > \chi^2_{n,\alpha} + n \ln 2$
4. $\sum_{i=1}^{n} \ln X_i < \chi^2_{n,1-\alpha} + n \ln 2$

Question Number : 56 Question Id : 562954131 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Suppose the distribution of X given θ is normal with mean θ and variance 15. Further, let the prior (improper) distribution of θ be proportional to 1, $-\infty < \theta < \infty$. If the observed value of X is 13, then which of the following statements is true?

1. Posterior mean $=$ Maximum likelihood estimate of θ, Posterior variance $=$ Var$(X|\theta)$
2. Posterior mean $=$ Maximum likelihood estimate of θ, Posterior variance $<$ Var$(X|\theta)$
3. Posterior mean $>$ Maximum likelihood estimate of θ, Posterior variance $=$ Var$(X|\theta)$
4. Posterior mean $>$ Maximum likelihood estimate of θ, Posterior variance $<$ Var$(X|\theta)$

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Question Number : 56 Question Id : 562954131 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

मानें कि दिए गए θ के लिए X का बंटन प्रसामान्य है जिसका माध्य θ तथा प्रसरण 15 है। फिर, मानें कि θ का पूर्व (अनुचित) बंटन 1 के समानुपाती है, जहाँ $-\infty < \theta < \infty$. यदि X का प्रेक्षित मान 13 है, तब निम्न में से कौन सा वक्तव्य सत्य है?

1. पश्च माध्य $=$ θ का अधिकतम् संभाविता आकलन,
   पश्च प्रसरण $= \text{Var}(X|\theta)$
2. पश्च माध्य $=$ θ का अधिकतम् संभाविता आकलन,
   पश्च प्रसरण $< \text{Var}(X|\theta)$
3. पश्च माध्य $>$ θ का अधिकतम् संभाविता आकलन,
   पश्च प्रसरण $= \text{Var}(X|\theta)$
4. पश्च माध्य $>$ θ का अधिकतम् संभाविता आकलन,
   पश्च प्रसरण $< \text{Var}(X|\theta)$

Question Number : 57 Question Id : 562954132 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

Consider the multiple linear regression model $y_i = \beta_0 + \beta_1 x_{1i} + \cdots + \beta_8 x_{8i} + \epsilon_i,\ i = 1, 2, \ldots, 29$, where $\epsilon_1, \epsilon_2, \ldots, \epsilon_{29}$ are independent and identically normal distributed with mean 0 and variance σ^2. Suppose the model is fitted using the method of least squares. If the calculated value of the F-statistic for testing the significance of regression is 2.50, then the possible values of R^2 and Adjusted R^2 are respectively

1. 0.30 and 0.10
2. 0.50 and 0.30
3. 0.50 and 0.16
4. 0.30 and -0.10

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Question Number : 57 Question Id : 562954132 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

बहुरैखिक समाश्रयण मॉडल $y_i = \beta_0 + \beta_1 x_{1i} + \cdots + \beta_8 x_{8i} + \epsilon_i,\ \ i = 1, 2, \ldots, 29$ पर विचार करें, जहां $\epsilon_1, \epsilon_2, \ldots, \epsilon_{29}$ स्वतंत्रत: तथा सर्वथासमानत: प्रसामान्यत: बंटित हैं जिनका माध्य 0 एवं प्रसरण σ^2 हैं। मानें कि मॉडल को न्यूनतम् वर्ग विधि से आसंजित किया जाता है। यदि समाश्रयण की सार्थकता परीक्षित करने के लिए F-प्रतिदर्शज का परिकलित मान 2.50 है, तब R^2 तथा Adjusted-R^2 के संभावित मान क्रमश: हैं

1. 0.30 तथा 0.10
2. 0.50 तथा 0.30
3. 0.50 तथा 0.16
4. 0.30 तथा -0.10

Question Number : 58 Question Id : 562954133 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Suppose $\begin{pmatrix} X_1 \\ X_2 \\ X_3 \end{pmatrix} \sim N_3\left(\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}\right)$ and $\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 3 & 0 & 0 \\ 2 & 2 & 0 \\ 4 & 0 & 4 \end{pmatrix} \begin{pmatrix} X_1 \\ X_2 \\ X_3 \end{pmatrix}$. Then the partial correlation coefficient $\rho_{YZ.X}$ is

1. $\frac{1}{2}$
2. $\frac{2}{3}$
3. $\frac{3}{4}$
4. 0

Question Number : 58 Question Id : 562954133 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें $\begin{pmatrix} X_1 \\ X_2 \\ X_3 \end{pmatrix} \sim N_3\left(\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}\right)$ तथा $\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 3 & 0 & 0 \\ 2 & 2 & 0 \\ 4 & 0 & 4 \end{pmatrix} \begin{pmatrix} X_1 \\ X_2 \\ X_3 \end{pmatrix}$.
तब आंशिक सहसंबंध गुणांक $\rho_{YZ.X}$ निम्न है

1. $\frac{1}{2}$
2. $\frac{2}{3}$
3. $\frac{3}{4}$
4. 0

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Question Number : 59 Question Id : 562954134 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

Suppose we want to estimate the population mean $\bar{Y}$ of a variable for a finite population of size 85, with 34 Statisticians and 51 Biologists. We consider the following sampling scheme:

A stratified random sample with 2 strata of Statisticians (Stratum-1) and Biologists (Stratum-2), where 12 Statisticians and 15 Biologists are drawn from Stratum-1 and Stratum-2, respectively, using SRSWOR scheme.

Denote $\bar{y}_S$, $\bar{y}_B$, and $\bar{y}$ as the mean of the variable among the Statistician sample, Biologist sample, and the combined sample, respectively. Which of the following is an unbiased estimator of $\bar{Y}$?

1. $\bar{y}$
2. $\dfrac{2\bar{y}_S + 3\bar{y}_B}{5}$
3. $\dfrac{4\bar{y}_S + 5\bar{y}_B}{9}$
4. $\dfrac{\frac{\bar{y}_S}{12} + \frac{\bar{y}_B}{15}}{\frac{1}{12} + \frac{1}{15}}$

Question Number : 59 Question Id : 562954134 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 3 Wrong Marks : 0.75

मानें कि हम 34 सांख्यिकी-विद् तथा 51 जीवविज्ञानियों की आमाप 85 की परिमित जनसंख्या के चर का माध्य $\bar{Y}$ आकलित करना चाहते हैं। हम निम्न प्रतिचयन योजना पर विचार करते हैं:

सांख्यिकी-विद् (स्तर-1) तथा जीवविज्ञानियों (स्तर-2) के 2 स्तरों के साथ स्तरित यादृच्छिक प्रतिदर्श जिनमें SRSWOR योजना का उपयोग करते हुए 12 सांख्यिकी-विद् तथा 15 जीवविज्ञानी क्रमशः स्तर-1 तथा स्तर-2 से चयन किए जातें हैं।

$\bar{y}_S$, $\bar{y}_B$, तथा $\bar{y}$ क्रमशः सांख्यिकी-विद्, जीवविज्ञानियों तथा संयुक्त प्रतिदर्शों में चर के माध्य को इंगित करते हैं। निम्न में से कौन सा $\bar{Y}$ का अनभिनत आकलक है?

1. $\bar{y}$
2. $\dfrac{2\bar{y}_S + 3\bar{y}_B}{5}$
3. $\dfrac{4\bar{y}_S + 5\bar{y}_B}{9}$
4. $\dfrac{\frac{\bar{y}_S}{12} + \frac{\bar{y}_B}{15}}{\frac{1}{12} + \frac{1}{15}}$

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Question Number : 60 Question Id : 562954135 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

Solve the following linear programming problem:

$$\text{maximize } z = x + y$$

subject to

$$\begin{aligned} 5x + 3y &\leq 30 \\ 2x + 6y &\leq 25 \\ 2x - y &\leq 8 \\ x \geq 0, y &\geq 0. \end{aligned}$$

Then the optimal value of the objective function is

1. $\frac{45}{11}$
2. $\frac{74}{11}$
3. $\frac{85}{12}$
4. $\frac{25}{6}$

Question Number : 60 Question Id : 562954135 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 3 Wrong Marks : 0.75

निम्न रैखिक प्रोग्रामन समस्या को हल करें:

$$\text{maximize } z = x + y$$

सप्रतिबंध

$$\begin{aligned} 5x + 3y &\leq 30 \\ 2x + 6y &\leq 25 \\ 2x - y &\leq 8 \\ x \geq 0, y &\geq 0. \end{aligned}$$

तब उद्देश्य फलन का इष्ठतम मान निम्न है

1. $\frac{45}{11}$
2. $\frac{74}{11}$
3. $\frac{85}{12}$
4. $\frac{25}{6}$

PART - C

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Section Id :	5629546
Section Number :	3
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	60
Number of Questions to be attempted :	20
Section Marks :	95
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	5629546
Question Shuffling Allowed :	Yes

Question Number : 61 Question Id : 562954136 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Consider the sequences $(s_n)_{n\geq 1}$ and $(t_n)_{n\geq 1}$ defined by

$$s_n = \sum_{k=0}^{n} \frac{1}{(k!)^2} \quad \text{and} \quad t_n = \sum_{k=0}^{n} \binom{n}{k} \frac{(-1)^k}{n^k}.$$

Which of the following statements are true?

1. $\limsup_{n\to\infty} t_n \leq \limsup_{n\to\infty} s_n$
2. $\limsup_{n\to\infty} t_n \leq e$
3. $\liminf_{n\to\infty} s_n \geq e^2$
4. $\liminf_{n\to\infty} t_n \geq e$

Question Number : 61 Question Id : 562954136 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

निम्नवत् परिभाषित अनुक्रमों $(s_n)_{n\geq 1}$ तथा $(t_n)_{n\geq 1}$ पर विचार करें

$$s_n = \sum_{k=0}^{n} \frac{1}{(k!)^2} \quad \text{तथा} \quad t_n = \sum_{k=0}^{n} \binom{n}{k} \frac{(-1)^k}{n^k}.$$

निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $\limsup_{n\to\infty} t_n \leq \limsup_{n\to\infty} s_n$
2. $\limsup_{n\to\infty} t_n \leq e$
3. $\liminf_{n\to\infty} s_n \geq e^2$
4. $\liminf_{n\to\infty} t_n \geq e$

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Question Number : 62 Question Id : 562954137 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

What is the value of the limit

$$\lim_{n\to\infty} \frac{1}{n}\left[(n+1)(n+2)\cdots(n+n)\right]^{1/n} ?$$

1. $\frac{2}{e}$
2. $\frac{4}{e}$
3. $\log_e 2 - 1$
4. $2\log_e 2 - 1$

Question Number : 62 Question Id : 562954137 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

निम्न सीमा का मान क्या है

$$\lim_{n\to\infty} \frac{1}{n}\left[(n+1)(n+2)\cdots(n+n)\right]^{1/n} ?$$

1. $\frac{2}{e}$
2. $\frac{4}{e}$
3. $\log_e 2 - 1$
4. $2\log_e 2 - 1$

Question Number : 63 Question Id : 562954138 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $(f_n)_{n\geq 1}$ be a sequence of real-valued functions on $\mathbb{R}$. Which of the following statements are true?

1. If each f_n is uniformly continuous and $(f_n)_{n\geq 1}$ converges to f uniformly, then f is uniformly continuous.
2. If each f_n is bounded and $(f_n)_{n\geq 1}$ converges to f pointwise, then f is bounded.
3. If each f_n is bounded and continuous, $(f_n)_{n\geq 1}$ converges pointwise to a bounded and continuous function f, then the convergence is uniform.
4. If each f_n is differentiable and $(f_n)_{n\geq 1}$ converges to f uniformly, then f is differentiable.

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Question Number : 63 Question Id : 562954138 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $\mathbb{R}$ पर वास्तविक मान वाले फलनों का एक अनुक्रम $(f_n)_{n\geq 1}$ है। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. यदि प्रत्येक f_n एक-समानतः सतत है तथा $(f_n)_{n\geq 1}$ एक-समानतः f पर अभिसरित होता है, तब f एक-समानतः सतत है।
2. यदि प्रत्येक f_n परिबद्ध है तथा $(f_n)_{n\geq 1}$ बिंदुवार f पर अभिसरित होता है, तो f परिबद्ध है।
3. यदि प्रत्येक f_n परिबद्ध है तथा सतत है, तब $(f_n)_{n\geq 1}$ परिबद्ध तथा सतत फलन f पर बिंदुवार अभिसरित होता है, तब अभिसरण एक-समान है।
4. यदि प्रत्येक f_n अवकलनीय है तथा $(f_n)_{n\geq 1}$ एक-समानतः f पर अभिसरित होता है, तब f अवकलनीय है।

Question Number : 64 Question Id : 562954139 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let f be a bounded, twice continuously differentiable real-valued function on $(0, \infty)$ such that $f''(x) \geq 0$ for all $x \in (0, \infty)$. Which of the following statements are true?

1. $f'(x) \leq 0$ for all $x > 0$.
2. $\lim_{x\to\infty} f'(x) = 0$.
3. $\lim_{x\to\infty} xf'(x)$ need not exist.
4. $\lim_{x\to\infty} xf'(x) = 0$.

Question Number : 64 Question Id : 562954139 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि f अंतराल $(0, \infty)$ पर वास्तविक मान वाला ऐसा परिबद्ध फलन है जो द्वि-सतत-अवकलनीय है व सभी $x \in (0, \infty)$ के लिए $f''(x) \geq 0$ है। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $f'(x) \leq 0$ सभी $x > 0$ के लिए।
2. $\lim_{x\to\infty} f'(x) = 0$.
3. $\lim_{x\to\infty} xf'(x)$ का अस्तित्व होना आवश्यक नहीं है।
4. $\lim_{x\to\infty} xf'(x) = 0$.

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Question Number : 65 Question Id : 562954140 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

For each $n \geq 1$, let $f_n : \mathbb{R} \to \mathbb{R}$ be a function defined by

$$f_n(x) = \frac{e^{-n^2x^2}}{n}.$$

Which of the following statements are true?

1. $(f_n)_{n\geq 1}$ converges uniformly to 0 on $\mathbb{R}$, and $(f'_n)_{n\geq 1}$ converges uniformly to 0 on the interval $(-M, M)$ for some positive real number M.
2. $(f_n)_{n\geq 1}$ converges uniformly to 0 on $\mathbb{R}$, and $(f'_n)_{n\geq 1}$ converges pointwise to 0 on $\mathbb{R}$.
3. $(f_n)_{n\geq 1}$ converges uniformly to 0 on $\mathbb{R}$ and $(f'_n)_{n\geq 1}$ does not converge pointwise to 0 on $\mathbb{R}$.
4. $(f_n)_{n\geq 1}$ converges pointwise to 0 on $\mathbb{R}$ but not uniformly on $\mathbb{R}$.

Question Number : 65 Question Id : 562954140 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

प्रत्येक $n \geq 1$ के लिए मानें कि फलन $f_n : \mathbb{R} \to \mathbb{R}$ निम्नवत् परिभाषित है

$$f_n(x) = \frac{e^{-n^2x^2}}{n}.$$

निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $(f_n)_{n\geq 1}$, $\mathbb{R}$ पर 0 को एकसमानत: अभिसरित होता है, तथा $(f'_n)_{n\geq 1}$, किसी धनात्मक वास्तविक संख्या M के लिए अंतराल $(-M, M)$ पर 0 को अभिसरित होता है।
2. $(f_n)_{n\geq 1}$, $\mathbb{R}$ पर 0 को एकसमानत: अभिसरित होता है, तथा $(f'_n)_{n\geq 1}$, $\mathbb{R}$ पर 0 को बिंदुवार अभिसरित होता है।
3. $(f_n)_{n\geq 1}$, $\mathbb{R}$ पर 0 को एकसमानत: अभिसरित होता है, तथा $(f'_n)_{n\geq 1}$, $\mathbb{R}$ पर 0 को बिंदुवार अभिसरित नहीं होता है।
4. $(f_n)_{n\geq 1}$, $\mathbb{R}$ पर 0 को बिंदुवार अभिसरित होता है लेकिन एकसमानत: नहीं।

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Question Number : 66 Question Id : 562954141 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let f and g be real-valued Riemann integrable functions on $[a, b]$ such that $g([a, b]) \subseteq [a, b]$. Which of the following statements are necessarily true?

1. The composition $f \circ g$ is Riemann integrable.
2. If $g(x) \neq 0$ for each $x \in [a, b]$, then $\dfrac{f}{g}$ is Riemann integrable.
3. The positive square root $\sqrt{f^2 + g^2}$ is Riemann integrable.
4. The composition $f \circ g$ is Riemann integrable, if both f and g are continuous.

Question Number : 66 Question Id : 562954141 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $[a, b]$ पर वास्तविक मान वाले रीमान समाकलनीय फलन f तथा g इस प्रकार से हैं कि $g([a, b]) \subseteq [a, b]$. निम्न वक्तव्यों में से कौन से आवश्यकत: सत्य हैं?

1. $f \circ g$ का संयोजन रीमान समाकलनीय है।
2. यदि प्रत्येक $x \in [a, b]$ के लिए, $g(x) \neq 0$, तब $\frac{f}{g}$ रीमान समाकलनीय है।
3. धनात्मक वर्ग मूल $\sqrt{f^2 + g^2}$ रीमान समाकलनीय है।
4. संयोजन $f \circ g$ रीमान समाकलनीय है, यदि f तथा g दोनों सतत हैं।

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Question Number : 67 Question Id : 562954142 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let μ denote the Lebesgue measure on $\mathbb{R}$. Suppose that f is a non-negative Lebesgue measurable function on $\mathbb{R}$. Let $0 = a_0 < a_1 < a_2 < \cdots$ be an unbounded sequence such that

$$a_{n+1} \leq c a_n$$

for some real number c and for all $n \geq 1$. Let

$$A_k = \{x \in \mathbb{R} \mid a_k \leq f(x) < a_{k+1}\}$$

for each $k \geq 0$. Which of the following statements are true?

1. If f is Lebesgue integrable on $\mathbb{R}$, then $\sum_{k \geq 0} a_k \, \mu(A_k)$ is finite.
2. If $\sum_{k \geq 0} a_k \, \mu(A_k)$ is finite, then f is Lebesgue integrable on $\mathbb{R}$.
3. If $\sum_{k \geq 0} a_k \, \mu(A_k)$ is finite, and $f(x) \geq a_1$ for all $x \in \mathbb{R}$, then f is Lebesgue integrable on $\mathbb{R}$.
4. If $\sum_{k \geq 0} a_k \, \mu(A_k)$ is finite and f is bounded, then f is Lebesgue integrable on $\mathbb{R}$.

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Question Number : 67 Question Id : 562954142 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $\mathbb{R}$ पर लेबेग माप μ द्वारा इंगित होता है। मानें कि $\mathbb{R}$ पर f एक ऋणेतर लेबेग मेय फलन है। मानें कि $0 = a_0 < a_1 < a_2 < \cdots$ एक ऐसा अपरिबद्ध अनुक्रम है ताकि सभी $n \geq 1$ के लिए

$$a_{n+1} \leq ca_n,$$

जहाँ c कोई वास्तविक संख्या है। मानें कि प्रत्येक $k \geq 0$ के लिए

$$A_k = \{x \in \mathbb{R} \mid a_k \leq f(x) < a_{k+1}\}.$$

निम्न वक्तव्यों में से कौन से सत्य हैं?

1. यदि $\mathbb{R}$ पर f लेबेग समाकलनीय है, तब $\sum_{k\geq 0} a_k \ \mu(A_k)$ परिमित है।
2. यदि $\sum_{k\geq 0} a_k \ \mu(A_k)$ परिमित है, तब $\mathbb{R}$ पर f लेबेग समाकलनीय है।
3. यदि $\sum_{k\geq 0} a_k \ \mu(A_k)$ परिमित है, तथा सभी $x \in \mathbb{R}$ के लिए $f(x) \geq a_1$, तब $\mathbb{R}$ पर f लेबेग समाकलनीय है।
4. यदि $\sum_{k\geq 0} a_k \ \mu(A_k)$ परिमित है तथा f परिबद्ध है, तब $\mathbb{R}$ पर f लेबेग समाकलनीय है।

Question Number : 68 Question Id : 562954143 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $f : \mathbb{R}^2 \to \mathbb{R}$ be a twice continuously differentiable non-zero function such that

$$f(tx_1, tx_2) = t^3 f(x_1, x_2)$$

for all $t > 0$ and $(x_1, x_2) \in \mathbb{R}^2$. Which of the following statements are necessarily true?

1. $3\frac{\partial f}{\partial x_1}(1,1) + 3\frac{\partial f}{\partial x_2}(1,1) = f(1,1)$
2. $\frac{\partial f}{\partial x_1}(1,-1) - \frac{\partial f}{\partial x_2}(1,-1) = 3f(1,-1)$
3. $x_1^2\frac{\partial^2 f}{\partial x_1^2}(x_1,x_2) + x_2^2\frac{\partial^2 f}{\partial x_2^2}(x_1,x_2) + 2x_1x_2\frac{\partial^2 f}{\partial x_1 \partial x_2}(x_1,x_2) = 6f(x_1,x_2)$
4. $x_1^2\frac{\partial^2 f}{\partial x_1^2}(x_1,x_2) + x_2^2\frac{\partial^2 f}{\partial x_2^2}(x_1,x_2) + 2x_1x_2\frac{\partial^2 f}{\partial x_1 \partial x_2}(x_1,x_2) = 9f(x_1,x_2)$

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Question Number : 68 Question Id : 562954143 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $f : \mathbb{R}^2 \to \mathbb{R}$ ऐसा द्वि-सतत-अवकलनीय शून्येतर फलन है कि सभी $t > 0$ तथा $(x_1, x_2) \in \mathbb{R}^2$ के लिए

$$f(tx_1, tx_2) = t^3 f(x_1, x_2).$$

निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $3\frac{\partial f}{\partial x_1}(1,1) + 3\frac{\partial f}{\partial x_2}(1,1) = f(1,1)$
2. $\frac{\partial f}{\partial x_1}(1,-1) - \frac{\partial f}{\partial x_2}(1,-1) = 3f(1,-1)$
3. $x_1^2\frac{\partial^2 f}{\partial x_1^2}(x_1,x_2) + x_2^2\frac{\partial^2 f}{\partial x_2^2}(x_1,x_2) + 2x_1x_2\frac{\partial^2 f}{\partial x_1 \partial x_2}(x_1,x_2) = 6f(x_1,x_2)$
4. $x_1^2\frac{\partial^2 f}{\partial x_1^2}(x_1,x_2) + x_2^2\frac{\partial^2 f}{\partial x_2^2}(x_1,x_2) + 2x_1x_2\frac{\partial^2 f}{\partial x_1 \partial x_2}(x_1,x_2) = 9f(x_1,x_2)$

Question Number : 69 Question Id : 562954144 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $M_2(\mathbb{R})$ denote the space of real 2×2 matrices. Let S be the vector subspace of $M_2(\mathbb{R})$ comprising of all symmetric matrices. Let $F : M_2(\mathbb{R}) \to S$ be the map defined by $F(X) = XX^T$. Let $DF_A : M_2(\mathbb{R}) \to S$ be the derivative of F at $A \in M_2(\mathbb{R})$. Which of the following statements are true?

1. If $AA^T = I$, then $DF_A : M_2(\mathbb{R}) \to S$ is surjective.
2. If $AA^T = I$, then $DF_A : M_2(\mathbb{R}) \to S$ need not be surjective.
3. If A is invertible, then $DF_A : M_2(\mathbb{R}) \to S$ is surjective.
4. If A is not invertible, then $DF_A : M_2(\mathbb{R}) \to S$ is surjective.

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Question Number : 69 Question Id : 562954144 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $M_2(\mathbb{R})$ वास्तविक 2×2 आव्यूहों की समष्टि को इंगित करता है। मानें कि $M_2(\mathbb{R})$ के सभी सममित आव्यूहों की सदिश उपसमष्टि S है। मानें कि $F : M_2(\mathbb{R}) \to S$ ऐसा प्रतिचित्र है जो $F(X) = XX^T$ द्वारा परिभाषित है। $DF_A : M_2(\mathbb{R}) \to S$ को $A \in M_2(\mathbb{R})$ पर F का अवकलज मानें। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. यदि $AA^T = I$, तब $DF_A : M_2(\mathbb{R}) \to S$ आच्छादी है।
2. यदि $AA^T = I$, तब $DF_A : M_2(\mathbb{R}) \to S$ का आच्छादी होना आवश्यक नहीं है।
3. यदि A व्युत्क्रमणीय है, तब $DF_A : M_2(\mathbb{R}) \to S$ आच्छादी है।
4. यदि A व्युत्क्रमणीय नहीं है, तब $DF_A : M_2(\mathbb{R}) \to S$ आच्छादी है।

Question Number : 70 Question Id : 562954145 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $C[0,1]$ be the $\mathbb{R}$-vector space of real valued continuous functions equipped with the norm

$$\|f\| = \sup_{x \in [0,1]} |f(x)|.$$

Let $T : C[0,1] \to C[0,1]$ be defined as

$$T(f)(x) = \int_0^x f(t)dt, \text{ for } x \in [0,1].$$

Let $T^n = T \circ T \circ \cdots \circ T$ (n times). Which of the following statements are true?

1. There exists $\alpha \in (0,1)$ such that for all $f, g \in C[0,1]$,
$$\|T(f) - T(g)\| \leq \alpha \|f - g\|.$$
2. There exists $\alpha \in (0,1)$ such that for all $f, g \in C[0,1]$,
$$\|T^2(f) - T^2(g)\| \leq \alpha \|f - g\|.$$
3. The set $\{f \in C[0,1] \ : \ T(f) = f\}$ is a singleton set.
4. $\|T^n\| \to \infty$ as $n \to \infty$.

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Question Number : 70 Question Id : 562954145 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $C[0,1]$, वास्तविक मान वाले सतत फलनों की $\mathbb{R}$-सदिश समष्टि है, जिस पर निम्न मानक लेते हैं

$$\| f \| = \sup_{x\in[0,1]} |f(x)|.$$

मानें कि $T : C[0,1] \to C[0,1]$ निम्नवत् परिभाषित है

$$T(f)(x) = \int_0^x f(t)dt, \ \ x \in [0,1] \text{ के लिए.}$$

मानें कि $T^n = T \circ T \circ \cdots \circ T$ (n बार). निम्न वक्तव्यों में से कौन से सत्य हैं?

1. कोई $\alpha \in (0,1)$ इस प्रकार से है कि सभी $f, g \in C[0,1]$ के लिए,
$$\| T(f) - T(g) \| \leq \alpha \| f - g \|$$
2. कोई $\alpha \in (0,1)$ इस प्रकार से है कि सभी $f, g \in C[0,1]$ के लिए,
$$\| T^2(f) - T^2(g) \| \leq \alpha \| f - g \|$$
3. समुच्चय $\{f \in C[0,1] \ : \ T(f) = f\}$ एक एकल समुच्चय है।
4. $\| T^n \| \to \infty$ जब $n \to \infty$.

Question Number : 71 Question Id : 562954146 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let V be the $\mathbb{R}$-vector space of all polynomials with real coefficients. Let $f(x) = x^2+x+1$. Which of the following subsets of V are linearly independent?

1. $\{f'(x), f(x) - f(x-1), 1\}$
2. $\{f(x+1) - f(x), f(x) - f(x-1), 1\}$
3. $\{f(x), f'(x), 1\}$
4. $\{f(x+1), f(x-1), f(x)\}$

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Question Number : 71 Question Id : 562954146 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि V वास्तविक गुणांकों वाले सभी बहुपदों की $\mathbb{R}$-सदिश समष्टि है। मानें कि $f(x) = x^2 + x + 1$ है। V के निम्न उपसमुच्चयों में से कौन से रैखिकत: स्वतंत्र हैं?

1. $\{f'(x), f(x) - f(x-1), 1\}$
2. $\{f(x+1) - f(x), f(x) - f(x-1), 1\}$
3. $\{f(x), f'(x), 1\}$
4. $\{f(x+1), f(x-1), f(x)\}$

Question Number : 72 Question Id : 562954147 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Consider the field $\mathbb{F}_3$ consisting of 3 elements. Let V be an $\mathbb{F}_3$-vector space of dimension 3 and W an $\mathbb{F}_3$-vector space of dimension 2. Which of the following statements are true?

1. The number of two dimensional subspaces of V is 13.
2. The number of surjective linear transformations from V to W is 624.
3. The number of one dimensional subspaces of V is 13.
4. The number of linear transformations from V to W is 3^6.

Question Number : 72 Question Id : 562954147 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

तीन अवयवों वाले क्षेत्र $\mathbb{F}_3$ पर विचार करें। V को 3 विमा वाली $\mathbb{F}_3$-सदिश समष्टि मानें तथा W को 2 विमा वाली $\mathbb{F}_3$-सदिश समष्टि मानें। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. V की द्वि-विमीय उपसमष्टियों की संख्या 13 है।
2. V से W को आच्छादी रैखिक रूपांतरणों की संख्या 624 है।
3. V के एक-विमीय रैखिक उपसमष्टियों की संख्या 13 है।
4. V से W को रैखिक रूपांतरणों की सख्या 3^6 है।

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Question Number : 73 Question Id : 562954148 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let A, B be distinct 2×2 real matrices. Which of the following statements are true?

1. If A is invertible, then AB and BA have the same minimal polynomial.
2. If 0 is an eigenvalue of A, then 0 is an eigenvalue of AB.
3. If 0 is the only eigenvalue of A and of B, then 0 is the only eigenvalue of AB.
4. If AB and BA have the same minimal polynomial, then either A or B is invertible.

Question Number : 73 Question Id : 562954148 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि A, B भिन्न 2×2 वास्तविक आव्यूह हैं। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. यदि A व्युत्क्रमणीय है, तब AB तथा BA का अल्पिष्ठ बहुपद समान होगा।
2. यदि A का एक अभिलक्षणिक मान 0 है, तब AB का एक अभिलक्षणिक मान 0 होगा।
3. यदि A, B का एकमात्र अभिलक्षणिक मान 0 है, तब AB का एकमात्र अभिलक्षणिक मान 0 होगा।
4. यदि AB तथा BA का अल्पिष्ठ बहुपद समान है, तब या तो A या फिर B व्युत्क्रमणीय होगा।

Question Number : 74 Question Id : 562954149 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $S, T : \mathbb{C}^2 \to \mathbb{C}^2$ be $\mathbb{C}$-linear transformations and I denote the identity transformation on $\mathbb{C}^2$. Which of the following statements are necessarily true?

1. $(ST - TS)^2 = \lambda I$ for some $\lambda \in \mathbb{C}$.
2. The characteristic polynomial of $(ST - TS)^2$ is $(x - \lambda)^2$ for some $\lambda \in \mathbb{C}$.
3. If $ST - TS$ has only one eigenvalue, then $ST - TS = \lambda I$ for some $\lambda \in \mathbb{C}$.
4. If $ST - TS$ has only one eigenvalue, then $(ST - TS)^2$ is the zero transformation.

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Question Number : 74 Question Id : 562954149 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $S, T : \mathbb{C}^2 \to \mathbb{C}^2$, $\mathbb{C}$-रैखिक रूपांतरण है तथा I द्वारा $\mathbb{C}^2$ पर तत्समक रूपांतरण इंगित होता है। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. कुछ $\lambda \in \mathbb{C}$ के लिए $(ST - TS)^2 = \lambda I$.
2. कुछ $\lambda \in \mathbb{C}$ के लिए $(ST - TS)^2$ का अभिलक्षणिक बहुपद $(x - \lambda)^2$ है।
3. यदि $ST - TS$ का केवल एक अभिलक्षणिक मान है, तब कुछ $\lambda \in \mathbb{C}$ के लिए, $ST - TS = \lambda I$.
4. यदि $ST - TS$ का केवल एक अभिलक्षणिक मान है, तब $(ST - TS)^2$ शून्य रूपांतरण है।

Question Number : 75 Question Id : 562954150 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $T : \mathbb{C}^7 \to \mathbb{C}^7$ be a $\mathbb{C}$-linear operator with eigenvalues $2, 3$ and 5. Consider the subspace

$$W := \{v \in \mathbb{C}^7 \ : \ (T - 5I)^k v = 0 \text{ for some integer } k > 0\}$$

of $\mathbb{C}^7$. Suppose that $(T - 2I)^2(T - 3I)^2(T - 5I)^2 = 0$. Which of the following statements are necessarily true?

1. T has at least four linearly independent eigenvectors.
2. $\dim W \geq 2$.
3. $\ker\left((T - 2I)^{2025}\right) = \ker\left((T - 2I)^{2026}\right)$
4. $(T - 2I)(T - 3I)$ is a nilpotent operator.

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Question Number : 75 Question Id : 562954150 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$T:\mathbb{C}^7 \to \mathbb{C}^7$ को $\mathbb{C}$-रैखिक संकारक मानें जिसके अभिलक्षणिक मान $2, 3$ तथा 5 हैं। $\mathbb{C}^7$ की निम्न उपसमष्टि पर विचार करें

$$W := \{v \in \mathbb{C}^7 \ : \ (T-5I)^k v = 0, \text{ किसी पूर्णांक } k > 0 \text{ के लिए}\}।$$

मानें कि $(T-2I)^2(T-3I)^2(T-5I)^2 = 0$ है। निम्न वक्तव्यों में से कौन से आवश्यकत: सत्य हैं?

1. T के कम से कम चार रैखिकत: स्वतंत्र अभिलक्षणिक सदिश हैं।
2. $\dim W \geq 2$.
3. $\ker\left((T-2I)^{2025}\right) = \ker\left((T-2I)^{2026}\right)$
4. $(T-2I)(T-3I)$ शून्यभावी (निलपोटेन्ट) संकारक है।

Question Number : 76 Question Id : 562954151 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Which of the following matrices are similar over $\mathbb{R}$ to the matrix

$$A = \begin{pmatrix} -1 & 1 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix} \ ?$$

1. $\begin{pmatrix} 0 & 0 & 0 & -1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 0 \end{pmatrix}$
2. $\begin{pmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 0 \end{pmatrix}$
3. $\begin{pmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}$
4. $\begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}$

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Question Number : 76 Question Id : 562954151 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

निम्न आव्यूहों में से कौन से, $\mathbb{R}$ पर आव्यूह

$$A = \begin{pmatrix} -1 & 1 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

के समरूप हैं?

1. $\begin{pmatrix} 0 & 0 & 0 & -1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 0 \end{pmatrix}$
2. $\begin{pmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 0 \end{pmatrix}$
3. $\begin{pmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}$
4. $\begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}$

Question Number : 77 Question Id : 562954152 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let V be a finite dimensional complex inner product space. For a linear map $T : V \to V$, let T^* denote its adjoint. Which of the following statements are true?

1. If trace of TT^* is zero, then $T = 0$.
2. Let $v \in V$ be such that $T^*T(v) = 0$. Then $T(v) = 0$.
3. Suppose $T = T^*$ and $N > 1$ be an integer. Let $v \in V$ be such that $T^{2^N}(v) = 0$. Then $T(v) = 0$.
4. Suppose that $TT^* = T^*T$ and $N > 1$ be an integer. Let $v \in V$ be such that $T^N(v) = 0$. Then $T(v) = 0$.

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Question Number : 77 Question Id : 562954152 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि V को परिमित विमीय सम्मिश्र आंतर-गुणनफल समष्टि है। किसी भी रैखिक प्रतिचित्र $T : V \to V$ के लिए, T^* से इसके सहखंडज को इंगित करें। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. यदि TT^* का अनुरेख (trace) शून्य है, तब $T = 0$ है।
2. यदि $v \in V$ के लिए $T^*T(v) = 0$ है, तब $T(v) = 0$ है।
3. मानें कि $T = T^*$ तथा $N > 1$ एक पूर्णांक है। मानें कि $v \in V$ इस प्रकार है कि $T^{2^N}(v) = 0$ है। तब $T(v) = 0$ है।
4. मानें कि $TT^* = T^*T$ तथा $N > 1$ एक पूर्णांक है। मानें कि $v \in V$ इस प्रकार है कि $T^N(v) = 0$ है। तब $T(v) = 0$ है।

Question Number : 78 Question Id : 562954153 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $B(v, w)$ be a nondegenerate symmetric bilinear form on $\mathbb{R}^2$ and let $q(v) = B(v, v)$ be the corresponding quadratic form. Suppose there exist vectors $v, w \in \mathbb{R}^2$ such that $B(v, v) = 0$ and $B(v, w) \neq 0$. Which of the following statements are necessarily true?

1. $B(w, w) = 0$
2. There exists an $\alpha \in \mathbb{R}$ such that $q(\alpha v + w) = 0$.
3. There are infinitely many $\alpha \in \mathbb{R}$ such that $q(\alpha v + w) = 0$.
4. q is equivalent to the quadratic form

$$Q(x, y) = x^2 - y^2 \text{ for all } (x, y) \in \mathbb{R}^2.$$

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Question Number : 78 Question Id : 562954153 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$B(v,w)$ को $\mathbb{R}^2$ पर कोई अनपभ्रष्ट सममित द्विरैखिक रूप तथा $q(v) = B(v,v)$ को संगत द्विघाती रूप मानें। मानें कि सदिश $v, w \in \mathbb{R}^2$ इस प्रकार से हैं कि $B(v,v) = 0$ तथा $B(v,w) \neq 0$ है। निम्न वक्तव्यों में से कौन से आवश्यकत: सत्य हैं?

1. $B(w,w) = 0$
2. ऐसा कोई $\alpha \in \mathbb{R}$ है कि $q(\alpha v + w) = 0.$
3. ऐसे अनंत $\alpha \in \mathbb{R}$ हैं कि $q(\alpha v + w) = 0.$
4. q द्विघाती रूप

$$\text{सभी } (x,y) \in \mathbb{R}^2 \text{ के लिए } Q(x,y) = x^2 - y^2$$

के तुल्य है।

Question Number : 79 Question Id : 562954154 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let f be an entire function which is not a polynomial. Let

$$A = \{\alpha \in \mathbb{C} \mid f^{(n)}(\alpha) \neq 0 \text{ for all } n \geq 0\}.$$

Which of the following statements are true?

1. A is nonempty.
2. A is finite.
3. A is infinite.
4. A is uncountable.

Question Number : 79 Question Id : 562954154 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि f एक ऐसा सर्वत्र वैश्लेषिक फलन है जो बहुपद नहीं है। मानें कि $A = \{\alpha \in \mathbb{C} \mid f^{(n)}(\alpha) \neq 0$ सभी $n \geq 0$ के लिए$\}$ है। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. A अरिक्त है।
2. A परिमित है।
3. A अनंत है।
4. A अगणनीय है।

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Question Number : 80 Question Id : 562954155 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let f be an entire function. Which of the following statements are true?

1. If $f(z) = f(z+1)$ for all $z \in \mathbb{C}$ then f is a constant function.
2. If $f(z) = f(z+1) = f(z+i)$ for all $z \in \mathbb{C}$ then f is a constant function.
3. If $f\left(\frac{1}{z}\right)$ has a removable singularity at 0 then f is a constant function.
4. If f is a non-constant function then $f\left(\frac{1}{z}\right)$ has a pole at 0.

Question Number : 80 Question Id : 562954155 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि f सर्वत्र वैश्लेषिक फलन है। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. यदि सभी $z \in \mathbb{C}$ के लिए $f(z) = f(z+1)$, तब f एक अचर फलन है।
2. यदि सभी $z \in \mathbb{C}$ के लिए $f(z) = f(z+1) = f(z+i)$, तब f एक अचर फलन है।
3. यदि $f\left(\frac{1}{z}\right)$ की 0 पर अपनेय विचित्रता है, तब f एक अचर फलन है।
4. यदि f कोई अचरेतर फलन है तब $f(\frac{1}{z})$ का 0 पर ध्रुव है।

Question Number : 81 Question Id : 562954156 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $\gamma : [0,1] \to \mathbb{C}$ be the function $t \mapsto e^{2\pi i t}$ and

$$I = \int_\gamma e^z e^{\frac{1}{z}} dz.$$

Which of the following statements are true?

1. $I = 0$
2. $\frac{1}{2\pi i} I \in \{4n \ : \ n \in \mathbb{Z}, n \geq 1\}$
3. $I = 2\pi i \sum_{n=0}^{\infty} \frac{1}{n!}$
4. $I = 2\pi i \sum_{n=0}^{\infty} \frac{1}{n!(n+1)!}$

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Question Number : 81 Question Id : 562954156 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$\gamma : [0,1] \to \mathbb{C}$ को $t \mapsto e^{2\pi it}$ फलन मानें तथा $I = \int_\gamma e^z e^{\frac{1}{z}} dz$ मानें। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $I = 0$
2. $\frac{1}{2\pi i} I \in \{4n \ : \ n \in \mathbb{Z}, n \geq 1\}$
3. $I = 2\pi i \sum_{n=0}^{\infty} \frac{1}{n!}$
4. $I = 2\pi i \sum_{n=0}^{\infty} \frac{1}{n!(n+1)!}$

Question Number : 82 Question Id : 562954157 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $\mathbb{D}^\times = \{z \in \mathbb{C} \ : \ 0 < |z| < 1\}$ be the punctured unit disk and f be a bijective holomorphic map of $\mathbb{D}^\times$ onto itself. Which of the following statements are true?

1. $\lim_{z\to 0} f(z)$ does not exist.
2. $\lim_{z\to 0} f(z)$ exists and has absolute value ≤ 1.
3. $\lim_{z\to 0} f(z) = 0$
4. There exists $\theta \in \mathbb{R}$ such that $f(z) = e^{i\theta} z$ for all $z \in \mathbb{D}^\times$.

Question Number : 82 Question Id : 562954157 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$\mathbb{D}^\times = \{z \in \mathbb{C} \mid 0 < |z| < 1\}$ को छिद्रित (punctured) एकल डिस्क मानें तथा f को $\mathbb{D}^\times$ का स्वयं पर एकैकी आच्छादक पूर्णसममित प्रतिचित्र मानें। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $\lim_{z\to 0} f(z)$ का अस्तित्व नहीं है।
2. $\lim_{z\to 0} f(z)$ का अस्तित्व है तथा इसका निरपेक्ष मान ≤ 1.
3. $\lim_{z\to 0} f(z) = 0$
4. $\theta \in \mathbb{R}$ इस प्रकार है कि सभी $z \in \mathbb{D}^\times$ के लिए $f(z) = e^{i\theta} z$.

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Question Number : 83 Question Id : 562954158 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let G be a group, H a subgroup of G, and $T = \{gH \mid g \in G\}$, the set of all left cosets of H in G. Let S_T be the set of all permutations of T and $\pi : G \longrightarrow S_T$ be the map defined by $\pi(g)(g_1H) = gg_1H$. For a prime number p, let $\mathbb{F}_p$ denote the field with p elements. In which of the following cases is $\ker \pi$ trivial?

1. $G = \mathrm{GL}_2(\mathbb{F}_p)$ and H is a subgroup of order p.
2. $G = \mathrm{SL}_2(\mathbb{F}_p)$ and H is a subgroup of order p.
3. $p \equiv 3 \pmod 4$, $G = \mathrm{GL}_2(\mathbb{F}_p)/\mathrm{SL}_2(\mathbb{F}_p)$ and H is a subgroup of order 2.
4. $p \equiv 1 \pmod 4$, $G = \mathrm{GL}_2(\mathbb{F}_p)/\mathrm{SL}_2(\mathbb{F}_p)$ and H is a subgroup of order 2.

Question Number : 83 Question Id : 562954158 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

G को कोई समूह मानें, H को G का एक उपसमूह मानें, तथा G में H के सभी वाम-सहसमुच्चयों के समुच्चय को $T = \{gH \mid g \in G\}$ मानें। S_T को T के सभी क्रमचयों का समुच्चय मानें, तथा $\pi : G \to S_T$ को $\pi(g)(g_1H) = gg_1H$ द्वारा परिभाषित प्रतिचित्र मानें। अभाज्य संख्या p के लिए $\mathbb{F}_p$ को p अवयवों का क्षेत्र (field) मानें। निम्न में से किन प्रसंगों में ker π तुच्छ है?

1. $G = \mathrm{GL}_2(\mathbb{F}_p)$, तथा H कोटि p का उपसमूह है।
2. $G = \mathrm{SL}_2(\mathbb{F}_p)$, तथा H, कोटि p का उपसमूह है।
3. $p \equiv 3 \pmod 4$, $G = \mathrm{GL}_2(\mathbb{F}_p)/\mathrm{SL}_2(\mathbb{F}_p)$, तथा H कोटि 2 का उपसमूह है।
4. $p \equiv 1 \pmod 4$, $G = \mathrm{GL}_2(\mathbb{F}_p)/\mathrm{SL}_2(\mathbb{F}_p)$, तथा H कोटि 2 का उपसमूह है।

Question Number : 84 Question Id : 562954159 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

For a group G, let $\mathrm{Aut}(G)$ denote the group (under composition) of all bijective group homomorphisms from G onto itself. Which of the following statements are true?

1. If G_1, G_2 are two groups such that $\mathrm{Aut}(G_1)$ is isomorphic to $\mathrm{Aut}(G_2)$, then G_1 is isomorphic to G_2.
2. If $|G| = 2$, then $\mathrm{Aut}(G \times G)$ is abelian.
3. If G is the group of complex numbers under addition, then $\mathrm{Aut}(G)$ is abelian.
4. If G is finite, then $\mathrm{Aut}(G)$ is finite.

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Question Number : 84 Question Id : 562954159 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

किसी समूह G के लिए, G से स्वयं पर सभी एकैकी आच्छादक समूह समाकारिताओं के समूह (संयोजन के अधीन) को $\mathrm{Aut}(G)$ से इंगित करें। निम्नलिखित वक्तव्यों में से कौन से सत्य हैं?

1. यदि $G_1,\ G_2$ ऐसे समूह हैं कि $\mathrm{Aut}(G_1)$, $\mathrm{Aut}(G_2)$ के साथ तुल्याकारी है, तब G_1, G_2 के साथ तुल्याकारी है।
2. यदि $|G| = 2$, तब $\mathrm{Aut}(G \times G)$ आबेली है।
3. यदि G सम्मिश्र संख्याओं का योग के अंतर्गत समूह है, तब $\mathrm{Aut}(G)$ आबेली है।
4. यदि G परिमित है, तब $\mathrm{Aut}(G)$ परिमित है।

Question Number : 85 Question Id : 562954160 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let G_1 and G_2 be subgroups of a group G. Which of the following statements are true?

1. If G_1 is normal in G, then $(G_2G_1)/G_1 \cong G_2/(G_2 \cap G_1)$.
2. If H_1 and H_2 are normal subgroups of G_1 and G_2, respectively, then

$$(G_1 \times G_2)/(H_1 \times H_2) \cong (G_1/H_1) \times (G_2/H_2).$$

3. If G_1 is normal in G_2 and G_2 is normal in G, then G_1 is normal in G.
4. Every subgroup of prime index in G is normal.

Question Number : 85 Question Id : 562954160 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि G_1 तथा G_2 एक समूह G के उपसमूह हैं। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. यदि G में G_1 प्रसामान्य है, तब $(G_2G_1)/G_1 \cong G_2/(G_2 \cap G_1)$.
2. यदि H_1 तथा H_2 क्रमशः G_1 तथा G_2 के प्रसामान्य उपसमूह हैं, तब

$$(G_1 \times G_2)/(H_1 \times H_2) \cong (G_1/H_1) \times (G_2/H_2).$$

3. यदि G_2 में G_1 प्रसामान्य है तथा G में G_2 प्रसामान्य है, तब G में G_1 प्रसामान्य है।
4. अभाज्य सूचकांक (index) का प्रत्येक उपसमूह G में प्रसामान्य है।

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Question Number : 86 Question Id : 562954161 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $f : \mathbb{Q}[X] \longrightarrow \mathbb{Q}[X]$ be a ring homomorphism with $f(1) = 1$. For $n \geq 1$, let $f^n = \underbrace{f \circ \cdots \circ f}_{n \text{ times}}$. Which of the following statements are true?

1. If f is onto, then so is f^n for all $n \geq 1$.
2. $\ker f^{n+1} = \ker f^n$ for some $n \geq 1$.
3. If f is onto, then f is one-to-one.
4. If f is one-to-one, then f is onto.

Question Number : 86 Question Id : 562954161 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$f: \mathbb{Q}[X] \to \mathbb{Q}[X]$ ऐसी वलय समकारिता है जिसके लिए $f(1) = 1$ है। हर $n \geq 1$ के लिए, $f^n = \underbrace{f \circ \cdots \circ f}_{n \text{ times}}$ मानें। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. यदि f आच्छादक है, तब सभी $n \geq 1$ के लिए f^n भी आच्छादक है।
2. किसी $n \geq 1$ के लिए, ker f^{n+1} = ker f^n.
3. यदि f आच्छादक है, तब f एकैकी है।
4. यदि f एकैकी है, तब f आच्छादक है।

Question Number : 87 Question Id : 562954162 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $f(X) = X^5 + X + 1 \in \mathbb{Q}[X]$ and $g(X) = X^5 - X + 1 \in \mathbb{Q}[X]$. Which of the following statements are true?

1. $f(X)$ is irreducible in $\mathbb{Q}[X]$, but $g(X)$ is not.
2. $g(X)$ is irreducible in $\mathbb{Q}[X]$, but $f(X)$ is not.
3. Both $f(X)$ and $g(X)$ are irreducible in $\mathbb{Q}[X]$.
4. Neither $f(X)$ nor $g(X)$ is irreducible in $\mathbb{Q}[X]$.

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Question Number : 87 Question Id : 562954162 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें $f(X) = X^5 + X + 1 \in \mathbb{Q}[X]$ तथा $g(X) = X^5 - X + 1 \in \mathbb{Q}[X]$ है। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $\mathbb{Q}[X]$ में $f(X)$ अलघुकरणीय है, लेकिन $g(X)$ नहीं है।
2. $\mathbb{Q}[X]$ में $g(X)$ अलघुकरणीय है, लेकिन $f(X)$ नहीं है।
3. $\mathbb{Q}[X]$ में $f(X)$ तथा $g(X)$ दोनों अलघुकरणीय हैं।
4. $\mathbb{Q}[X]$ में न तो $f(X)$ और न ही $g(X)$ अलघुकरणीय है।

Question Number : 88 Question Id : 562954163 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $p > 2$ be a prime number. Let $\mathbb{F}_p$ denote the field with p elements and $\overline{\mathbb{F}}_p$ an algebraic closure of $\mathbb{F}_p$. Which of the following statements are true?

1. Let $f(X) \in \mathbb{F}_p[X]$ and α be a root of f in $\overline{\mathbb{F}}_p$. Then $\mathbb{F}_p(\alpha)$ is the splitting field of f in $\overline{\mathbb{F}}_p$.
2. Let $f, g \in \mathbb{F}_p[X]$ be irreducible polynomials of same degree and α be a root of f in $\overline{\mathbb{F}}_p$. Then $\mathbb{F}_p(\alpha)$ is the splitting field of g in $\overline{\mathbb{F}}_p$.
3. $\mathbb{F}_p[X]$ has infinitely many irreducible polynomials.
4. The set $\{a + b \mid a, b \in \mathbb{F}_p\}$ is contained in $\{a^2 + b^2 \mid a, b \in \mathbb{F}_p\}$.

Question Number : 88 Question Id : 562954163 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $p > 2$ कोई अभाज्य संख्या है। $\mathbb{F}_p$ द्वारा p अवयवों का क्षेत्र (field), तथा $\overline{\mathbb{F}}_p$ द्वारा $\mathbb{F}_p$ का बीजीय संवरक इंगित होते हैं। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. मानें कि $f(X) \in \mathbb{F}_p[X]$ तथा $\overline{\mathbb{F}}_p$ में f का एक मूल α है। तब $\mathbb{F}_p(\alpha)$, $\overline{\mathbb{F}}_p$ में f का विभाजक क्षेत्र है।
2. मानें कि $f, g \in \mathbb{F}_p[X]$ समान घात (degree) के अलघुकरणीय बहुपद हैं तथा $\overline{\mathbb{F}}_p$ में f का एक मूल α है। तब $\mathbb{F}_p(\alpha)$, $\overline{\mathbb{F}}_p$ में g का विभाजक क्षेत्र है।
3. $\mathbb{F}_p[X]$ में अनंत अलघुकरणीय बहुपद हैं।
4. समुच्चय $\{a + b \mid a, b \in \mathbb{F}_p\}$, समुच्चय $\{a^2 + b^2 \mid a, b \in \mathbb{F}_p\}$ में अंतर्विष्ट है।

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Question Number : 89 Question Id : 562954164 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $p : \mathbb{R} \longrightarrow \mathbb{R}$ be a nonconstant polynomial. Which of the following statements are true?

1. The preimage of a compact set under p is a compact set.
2. The preimage of a connected set under p is a connected set.
3. Every point $x \in \mathbb{R}$ has an open neighbourhood U_x such that the restriction $p|_{U_x}$ is a homeomorphism onto an open set in $\mathbb{R}$.
4. The image of a bounded set under p is a bounded set.

Question Number : 89 Question Id : 562954164 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $p : \mathbb{R} \to \mathbb{R}$ एक अचेरतर बहुपद है। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. p के अंतर्गत किसी संहत समुच्चय का पूर्व प्रतिबिंब संहत समुच्चय होगा।
2. p के अंतर्गत किसी सम्बद्ध समुच्चय का पूर्व प्रतिबिंब सम्बद्ध समुच्चय होगा।
3. प्रत्येक बिंदु $x \in \mathbb{R}$ का एक विवृत प्रतिवेश U_x इस प्रकार से है कि प्रतिबंध $p|_{U_x}$, $\mathbb{R}$ में एक विवृत समुच्चय पर आच्छादक समरूपता है।
4. p के अंतर्गत किसी परिबद्ध समुच्चय का प्रतिबिंब परिबद्ध समुच्चय होगा।

Question Number : 90 Question Id : 562954165 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Consider $\mathbb{R}$ with the usual topology and $S = \{a + b\sqrt{2} \mid a, b \in \mathbb{Q}\} \subset \mathbb{R}$ with the subspace topology. Which of the following statements are true?

1. S is dense in $\mathbb{R}$.
2. $S \setminus \mathbb{Q}$ is dense in $\mathbb{R}$.
3. $S \setminus \mathbb{Q}$ is discrete with subspace topology on S.
4. S is connected.

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Question Number : 90 Question Id : 562954165 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$\mathbb{R}$ पर प्रचलित सांस्थितिकी लें तथा $S = \{a+b\sqrt{2} \mid a, b\in \mathbb{Q}\} \subset \mathbb{R}$ पर उपसमष्टि सांस्थितिकी लें। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $\mathbb{R}$ में S सघन है।
2. $\mathbb{R}$ में $S\backslash\mathbb{Q}$ सघन है।
3. S से उपसमष्टि सांस्थितिकी लेने पर $S\backslash\mathbb{Q}$ विविक्त है।
4. S सम्बद्ध है।

Question Number : 91 Question Id : 562954166 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $D = \{(x, y) \in \mathbb{R}^2 : -1 \leq x \leq 1, -1 \leq y \leq 1\}$, and $f : D \to \mathbb{R}$ be the function defined by

$$f(x, y) = 1 + \sqrt{y_+}, \text{ where } y_+ = \max\{y, 0\}.$$

Consider the initial value problem (IVP)

$$\frac{dy}{dx} = f(x, y), \; y(0) = 0.$$

Then which of the following statements are true?

1. f is a Lipschitz continuous function on D
2. f is NOT a Lipschitz continuous function on D
3. IVP has at least one solution
4. IVP has NO solution

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Question Number : 91 Question Id : 562954166 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $D = \{(x, y) \in \mathbb{R}^2 : -1 \leq x \leq 1, -1 \leq y \leq 1\}$, तथा $f : D \to \mathbb{R}$ निम्नवत् परिभाषित फलन है

$$f(x, y) = 1 + \sqrt{y_+},\ \text{जहां}\ y_+ = \max\{y, 0\}.$$

निम्न प्रारंभिक मान समस्या (IVP) पर विचार करें

$$\frac{dy}{dx} = f(x, y),\ \ y(0) = 0.$$

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. D पर f लिपशिट्ज सतत फलन है।
2. D पर f लिपशिट्ज सतत फलन **नहीं** है।
3. IVP का कम से कम एक हल है।
4. IVP का कोई हल **नहीं** है।

Question Number : 92 Question Id : 562954167 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Consider the ordinary differential equation (ODE)

$$\frac{d^2y}{dx^2} + (\cos(x))\frac{dy}{dx} + (\sin(x))y = 0.$$

Let $\varphi_1(x), \varphi_2(x)$ be solutions of the ODE, satisfying

$$\varphi_1(0) = 1,\ \frac{d\varphi_1}{dx}(0) = 0,\ \text{and}\ \varphi_2(0) = 0,\ \frac{d\varphi_2}{dx}(0) = 1.$$

Then which of the following statements are true?

1. $\varphi_1(x + 2\pi)$ is also a solution of ODE
2. $\varphi_2(x + 4\pi)$ is also a solution of ODE
3. There are NO constants a, b such that $\varphi_2(x + 4\pi) = a\varphi_1(x) + b\varphi_2(x)$
4. There exist $a, b \in \mathbb{R}$ such that $\varphi_1(x + 2\pi) = a\varphi_1(x) + b\varphi_2(x)$

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Question Number : 92 Question Id : 562954167 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

साधारण अवकल समीकरण (ODE)

$$\frac{d^2y}{dx^2} + (\cos(x))\frac{dy}{dx} + (\sin(x))y = 0$$

पर विचार करें। मानें कि ODE के निम्न को संतुष्ट करने वाले हल $\varphi_1(x)$, $\varphi_2(x)$ हैं

$$\varphi_1(0) = 1,\ \frac{d\varphi_1}{dx}(0) = 0, \text{ तथा } \varphi_2(0) = 0,\ \frac{d\varphi_2}{dx}(0) = 1.$$

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $\varphi_1(x + 2\pi)$ भी ODE का एक हल है।
2. $\varphi_2(x + 4\pi)$ भी ODE का एक हल है।
3. ऐसे कोई अचर a, b **नहीं** हैं कि $\varphi_2(x + 4\pi) = a\varphi_1(x) + b\varphi_2(x)$
4. ऐसे $a, b \in \mathbb{R}$ हैं कि $\varphi_1(x + 2\pi) = a\varphi_1(x) + b\varphi_2(x)$

Question Number : 93 Question Id : 562954168 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

For a continuous function q defined on $\mathbb{R}$, consider the ordinary differential equation (ODE)

$$\frac{d^2y}{dx^2} + q(x)y = 0,\ x \in \mathbb{R}.$$

Then which of the following statements are FALSE?

1. There exists a q such that $\cos(x)$ and $e^x \cos(x)$ are solutions of ODE
2. There exists a q such that $\sin(x)$ and $\cos(x)$ are solutions of ODE
3. There exists a q such that $e^x \sin(x)$ and $e^x \cos(2x)$ are solutions of ODE
4. There exists a q such that xe^x and $x(x-1)e^x$ are solutions of ODE

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Question Number : 93 Question Id : 562954168 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$\mathbb{R}$ पर परिभाषित किसी सतत फलन q के लिए, निम्न साधारण अवकल समीकरण (ODE) पर विचार करें

$$\frac{d^2y}{dx^2} + q(x)y = 0,\ x \in \mathbb{R}.$$

तब निम्न वक्तव्यों में से कौन से **असत्य** हैं?

1. कोई q इस प्रकार से है कि $\cos(x)$ तथा $e^x \cos(x)$, ODE के हल हैं
2. कोई q इस प्रकार से है कि $\sin(x)$ तथा $\cos(x)$, ODE के हल हैं
3. कोई q इस प्रकार से है कि $e^x \sin(x)$ तथा $e^x \cos(2x)$, ODE के हल हैं
4. कोई q इस प्रकार से है कि xe^x तथा $x(x-1)e^x$, ODE के हल हैं

Question Number : 94 Question Id : 562954169 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Consider the Cauchy problem (CP)

$$x\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 1,$$
$$u(0, y) = e^y,\ y \in \mathbb{R}.$$

Then which of the following statements are true?

1. There is NO neighbourhood of the origin on which (CP) has a solution
2. (CP) has a unique solution defined on some neighbourhood of the origin
3. (CP) has a unique solution defined on some neighbourhood of the point $(0, 1)$ in the xy-plane
4. (CP) has an infinite number of solutions, each of which is defined on some neighbourhood of the origin

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Question Number : 94 Question Id : 562954169 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

निम्न कॉशी समस्या (CP) पर विचार करें

$$x\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 1,$$
$$u(0, y) = e^{y},\ y \in \mathbb{R}.$$

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. मूल बिंदु का कोई भी ऐसा प्रतिवेश **नहीं** है जिसमें (CP) का हल हो
2. (CP) का एक अद्‌वितीय हल है जो मूल बिंदु के किसी प्रतिवेश पर परिभाषित है
3. (CP) का अद्‌वितीय हल है जो xy-तल के $(0, 1)$ बिंदु के किसी प्रतिवेश पर परिभाषित है
4. (CP) के हलों की संख्या अनंत है, जिनमें से प्रत्येक मूलबिंदु के किसी प्रतिवेश पर परिभाषित है

Question Number : 95 Question Id : 562954170 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Suppose $u = u(x, y)$ is the solution of the boundary value problem

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial u}{\partial x} = 0 \quad \text{in } \{(x, y) \in \mathbb{R}^2 : x^2 + y^2 < 1\},$$

$$u(x, y) = 1 + 2x^2y^2 \quad \text{on } \{(x, y) \in \mathbb{R}^2 : x^2 + y^2 = 1\}.$$

Then which of the following statements are true?

1. The minimum value of u is 1
2. The maximum value of u is 3
3. The minimum value of u is 2
4. The maximum value of u is $\frac{3}{2}$

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Question Number : 95 Question Id : 562954170 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $u = u(x, y)$ निम्न परिसीमा मान समस्या का हल है

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial u}{\partial x} = 0, \qquad \{(x, y) \in \mathbb{R}^2 \, : \, x^2 + y^2 < 1\} \text{ में},$$

$$u(x, y) = 1 + 2x^2y^2, \qquad \{(x, y) \in \mathbb{R}^2 \, : \, x^2 + y^2 = 1\} \text{ पर।}$$

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. u का न्यूनतम मान 1 है।
2. u का अधिकतम मान 3 है।
3. u का न्यूनतम मान 2 है।
4. u का अधिकतम मान $\frac{3}{2}$ है।

Question Number : 96 Question Id : 562954171 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Consider the initial value problem (IVP)

$$y' + y = 0, \; y(0) = 1.$$

Let (y_n) be the iterates of forward Euler method, applied to the IVP, with step size h where $0 < h < 1$.

Then which of the following statements are true?

1. The sequence (y_n) does NOT converge
2. $y_n \to 0$ as $n \to \infty$
3. $0 \leq y_n \leq 1$ for $n = 0, 1, 2, \ldots$
4. $|y(nh) - y_n| \to 0$ as $n \to \infty$

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Question Number : 96 Question Id : 562954171 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

निम्न प्रारम्भिक मान समस्या (IVP) पर विचार करें

$$y' + y = 0,\ y(0) = 1.$$

मानें कि IVP पर सोपान आमाप h के साथ, जहाँ $0 < h < 1$ है, अग्र ऑयलर विधि का उपयोग करने पर (y_n) पुनरावृत्ति परिणाम हैं।

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. अनुक्रम (y_n) अभिसरित **नहीं** होता
2. $y_n \to 0$ जब $n \to \infty$
3. $n = 0, 1, 2, \ldots$ के लिए $0 \le y_n \le 1$
4. $|y(nh) - y_n| \to 0$ जब $n \to \infty$

Question Number : 97 Question Id : 562954172 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

If $\alpha, \beta \in \mathbb{R}$ are such that the equation

$$\int_0^3 f(x)\,dx = \frac{3}{2}\big[f(\alpha) + f(\alpha+\beta)\big]$$

holds for all polynomials $f(x)$ of degree less than or equal to 2, then which of the following statements are true?

1. $(\alpha, \beta) = \left(\frac{3-\sqrt{3}}{2}, \sqrt{3}\right)$ or $(\alpha, \beta) = \left(\frac{3+\sqrt{3}}{2}, -\sqrt{3}\right)$
2. $(\alpha, \beta) = \left(\frac{3-\sqrt{2}}{2}, \sqrt{2}\right)$ or $(\alpha, \beta) = \left(\frac{3+\sqrt{2}}{2}, -\sqrt{2}\right)$
3. $(\alpha, \beta) = \left(\frac{3-\sqrt{5}}{2}, \sqrt{5}\right)$ or $(\alpha, \beta) = \left(\frac{3+\sqrt{5}}{2}, -\sqrt{5}\right)$
4. $(\alpha, \beta) = \left(\frac{3-\sqrt{7}}{2}, \sqrt{7}\right)$ or $(\alpha, \beta) = \left(\frac{3+\sqrt{7}}{2}, -\sqrt{7}\right)$

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Question Number : 97 Question Id : 562954172 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

यदि $\alpha, \beta \in \mathbb{R}$ इस प्रकार हैं कि समीकरण

$$\int_0^3 f(x)\,dx = \frac{3}{2}\left[f(\alpha) + f(\alpha+\beta)\right]$$

अधिकतम 2 घात के सभी बहुपदों $f(x)$ के लिए मान्य है, तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $(\alpha, \beta) = \left(\frac{3-\sqrt{3}}{2}, \sqrt{3}\right)$ या $(\alpha, \beta) = \left(\frac{3+\sqrt{3}}{2}, -\sqrt{3}\right)$
2. $(\alpha, \beta) = \left(\frac{3-\sqrt{2}}{2}, \sqrt{2}\right)$ या $(\alpha, \beta) = \left(\frac{3+\sqrt{2}}{2}, -\sqrt{2}\right)$
3. $(\alpha, \beta) = \left(\frac{3-\sqrt{5}}{2}, \sqrt{5}\right)$ या $(\alpha, \beta) = \left(\frac{3+\sqrt{5}}{2}, -\sqrt{5}\right)$
4. $(\alpha, \beta) = \left(\frac{3-\sqrt{7}}{2}, \sqrt{7}\right)$ या $(\alpha, \beta) = \left(\frac{3+\sqrt{7}}{2}, -\sqrt{7}\right)$

Question Number : 98 Question Id : 562954173 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

For $\alpha \geq 0$, consider the functional

$$J_\alpha[y] = \int_1^2 \frac{(y')^2}{x^\alpha}\,dx$$

defined for all continuously differentiable functions defined on the interval $[1, 2]$ satisfying the conditions

$$y(1) = 1,\ y(2) = 2.$$

Then which of the following statements are true?

1. $y(x) = \frac{1}{15}(x^4 + 14)$ is an extremal for J_3
2. $y(x) = \frac{1}{3}(x^2 + 2)$ is an extremal for J_1
3. $y(x) = x$ is an extremal for J_0
4. $y(x) = \frac{1}{2}(x^2 - x + 2)$ is an extremal for J_1

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Question Number : 98 Question Id : 562954173 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$\alpha \geq 0$ के लिए मानें कि फलनक

$$J_\alpha[y] = \int_1^2 \frac{(y')^2}{x^\alpha}\, dx,$$

ऐसे सभी फलनों के लिए परिभाषित है, जो अंतराल $[1, 2]$ पर सतत अवकलनीय हैं व निम्न प्रतिबंधों को संतुष्ट करते हैं

$$y(1) = 1,\ y(2) = 2.$$

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $y(x) = \frac{1}{15}\left(x^4 + 14\right),\ J_3$ के लिए चरमक है
2. $y(x) = \frac{1}{3}\left(x^2 + 2\right),\ J_1$ के लिए चरमक है
3. $y(x) = x,\ J_0$ के लिए चरमक है
4. $y(x) = \frac{1}{2}\left(x^2 - x + 2\right),\ J_1$ के लिए चरमक है

Question Number : 99 Question Id : 562954174 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

For $a, b, c \in \mathbb{R}$, consider the variational problem:

$$\text{Minimize } J[y] = \int_0^2 \left[a\left(y'\right)^2 + 2byy' + cy^2\right]\, dx,$$

subject to

$$y(0) = 10,\ y(1) = 100.$$

Then which of the following statements are true?

1. If $(a, b, c) = (-2, 1, -2)$, then every admissible extremal is a minimizer
2. If $(a, b, c) = (1, 0, 2)$, then every admissible extremal is a minimizer
3. If $(a, b, c) = (2, -1, 1)$, then every admissible extremal is a minimizer
4. If $(a, b, c) = (1, -2, 5)$, then every admissible extremal is a minimizer

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Question Number : 99 Question Id : 562954174 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$a, b, c \in \mathbb{R}$ के लिए, निम्न विचरणात्मक समस्या पर विचार करें

$$\text{Minimize } J[y] = \int_0^2 \left[a\,(y')^2 + 2byy' + cy^2\right]\,dx,$$

सप्रतिबंध

$$y(0) = 10,\ y(1) = 100.$$

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. यदि $(a, b, c) = (-2, 1, -2)$, तब प्रत्येक ग्राहय चरमक न्यूनतमकारक है
2. यदि $(a, b, c) = (1, 0, 2)$, तब प्रत्येक ग्राहय चरमक न्यूनतमकारक है
3. यदि $(a, b, c) = (2, -1, 1)$, तब प्रत्येक ग्राहय चरमक न्यूनतमकारक है
4. यदि $(a, b, c) = (1, -2, 5)$, तब प्रत्येक ग्राहय चरमक न्यूनतमकारक है

Question Number : 100 Question Id : 562954175 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $u(x)$ be the solution to the Volterra integral equation

$$u(x) = x^2 + 4\int_0^x (t-x)^2 u(t)\,dt$$

Then which of the following statements are true?

1. $u(0) = 0$
2. $u\left(\frac{2\pi}{\sqrt{3}}\right) = \frac{1}{6}\left(e^{\frac{4\pi}{\sqrt{3}}} - e^{-\frac{2\pi}{\sqrt{3}}}\right)$
3. $u\left(\frac{\pi}{2\sqrt{3}}\right) = \frac{1}{6}\left(e^{\frac{\pi}{\sqrt{3}}} - \sqrt{3}\,e^{-\frac{\pi}{2\sqrt{3}}}\right)$
4. $u\left(\frac{\pi}{2\sqrt{3}}\right) = \frac{1}{6}\left(e^{\frac{\pi}{\sqrt{3}}} + \sqrt{3}\,e^{-\frac{\pi}{\sqrt{3}}}\right)$

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Question Number : 100 Question Id : 562954175 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $u(x)$ निम्न वोल्टेरा समाकल समीकरण का हल है

$$u(x) = x^2 + 4\int_0^x (t-x)^2 u(t)\,dt$$

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $u(0) = 0$
2. $u\left(\frac{2\pi}{\sqrt{3}}\right) = \frac{1}{6}\left(e^{\frac{4\pi}{\sqrt{3}}} - e^{-\frac{2\pi}{\sqrt{3}}}\right)$
3. $u\left(\frac{\pi}{2\sqrt{3}}\right) = \frac{1}{6}\left(e^{\frac{\pi}{\sqrt{3}}} - \sqrt{3}\,e^{-\frac{\pi}{2\sqrt{3}}}\right)$
4. $u\left(\frac{\pi}{2\sqrt{3}}\right) = \frac{1}{6}\left(e^{\frac{\pi}{\sqrt{3}}} + \sqrt{3}\,e^{-\frac{\pi}{\sqrt{3}}}\right)$

Question Number : 101 Question Id : 562954176 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let f and K be such that the solution of the initial value problem

$$y'' - 3y' + 2y = 4\sin(x),\ \ y(0) = 1,\ y'(0) = -2$$

satisfies the Volterra integral equation

$$y(x) = f(x) + \int_0^x K(x,t)y(t)\,dt.$$

Then which of the following statements are true?

1. $f'(\pi) = 3$
2. $f(\pi) + f'(\pi) = 4 - \pi$
3. $f(\pi) + f'(\pi) = 2 - \pi$
4. $f(0) + f'(0) = -4$

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Question Number : 101 Question Id : 562954176 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि f तथा K ऐसे हैं कि प्रारंम्भिक मान समस्या

$$y'' - 3y' + 2y = 4\sin(x),\ y(0) = 1,\ y'(0) = -2$$

का हल निम्न वोल्टेरा समाकल समीकरण को संतुष्ट करता है

$$y(x) = f(x) + \int_0^x K(x,t)y(t)\,dt.$$

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $f'(\pi) = 3$
2. $f(\pi) + f'(\pi) = 4 - \pi$
3. $f(\pi) + f'(\pi) = 2 - \pi$
4. $f(0) + f'(0) = -4$

Question Number : 102 Question Id : 562954177 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Suppose f, g are smooth functions of generalized coordinates $q_1, q_2, \ldots, q_n$, the associated conjugate momenta $p_1, p_2, \ldots, p_n$, and time t. Let $[f, g]$ denote the Poisson bracket of f and g. Suppose H is a Hamiltonian of the system.

Then which of the following statements are true?

1. $\frac{\partial}{\partial t}[f,g] = \left[\frac{\partial f}{\partial t}, g\right] + \left[f, \frac{\partial g}{\partial t}\right]$
2. If f is a constant of motion, and f is independent of t, then $[H, f]$ is a constant of motion
3. $\big[[H,f],g\big] + \big[[g,H],f\big] + \big[[f,g],H\big] = 0$
4. If f and g are constants of motion, then $[f, g]$ is a constant of motion

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Question Number : 102 Question Id : 562954177 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि f, g व्यापकीकृत निर्देशांकों $q_1, q_2, \ldots, q_n$, सहचारी संयुग्मी आघूर्ण $p_1, p_2, \ldots, p_n$, तथा समय t के मसृण फलन हैं। मानें कि $[f, g]$, f एवं g के प्वासों कोष्ठक को इंगित करता है। मानें कि H इस निकाय का हैमिल्टनी है। तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $\frac{\partial}{\partial t}[f, g] = \left[\frac{\partial f}{\partial t}, g\right] + \left[f, \frac{\partial g}{\partial t}\right]$
2. यदि f गति का नियतांक है, तथा f की t पर निर्भरता नहीं है, तब $[H, f]$ गति का नियतांक है
3. $[[H, f], g] + [[g, H], f] + [[f, g], H] = 0$
4. यदि f तथा g गति के नियतांक हैं, तब $[f, g]$ गति का नियतांक हैं।

Question Number : 103 Question Id : 562954178 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let X and Y be independent Poisson random variables with means 4 and 2, respectively. Then, which of the following statements are true?

1. The conditional distribution of X given $X + Y = 3$ is Binomial$(3, \frac{1}{3})$
2. $P(X \leq 1 | X + Y = 3) = \frac{7}{27}$
3. $E(X | X + Y = 3) = 2$
4. The value of the characteristic function of $X + Y$ at the point $t = \pi$ is e^{-12}

Question Number : 103 Question Id : 562954178 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि X तथा Y, क्रमश: माध्य 4 तथा 2 वाले स्वतंत्र प्वासों यादृच्छिक चर हैं। तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $X + Y = 3$ दिया हो तो X का सप्रतिबंध बंटन Binomial$(3, \frac{1}{3})$ है
2. $P(X \leq 1 | X + Y = 3) = \frac{7}{27}$
3. $E(X | X + Y = 3) = 2$
4. बिंदु $t = \pi$ पर $X + Y$ के अभिलक्षणिक फलन का मान e^{-12} है

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Question Number : 104 Question Id : 562954179 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let X be a random variable with the cumulative distribution function

$$F_X(x) = \begin{cases} 0, & \text{if } x < 0, \\ \frac{x+2}{5}, & \text{if } 0 \leq x < 2, \\ 1, & \text{if } x \geq 2. \end{cases}$$

Then, which of the following statements are true?

1. $E(X^2) = \frac{4}{3}$
2. $P\left(|X - \frac{4}{5}| \geq 1\right) = \frac{19}{25}$
3. The upper bound of $P\left(|X - \frac{4}{5}| \geq 1\right)$, using Chebyshev's inequality, is $\frac{52}{75}$
4. The value of the moment generating function, $M_X(t)$, at $t = 1$ is $\frac{e^2-1}{5}$

Question Number : 104 Question Id : 562954179 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि X निम्न संचयी बंटन फलन का एक यादृच्छिक चर है

$$F_X(x) = \begin{cases} 0, & \text{यदि } x < 0, \\ \frac{x+2}{5}, & \text{यदि } 0 \leq x < 2, \\ 1, & \text{यदि } x \geq 2. \end{cases}$$

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $E(X^2) = \frac{4}{3}$
2. $P\left(|X - \frac{4}{5}| \geq 1\right) = \frac{19}{25}$
3. शेबीशेव असमिका का उपयोग करके $P\left(|X - \frac{4}{5}| \geq 1\right)$ की उपरि-सीमा $\frac{52}{75}$ है
4. आघूर्ण जनक फलन $M_X(t)$ का $t = 1$ पर मान $\frac{e^2-1}{5}$ है

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Question Number : 105 Question Id : 562954180 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Consider a Markov chain $\{X_n : n \geq 1\}$ on state space $\{1, 2, 3, 4, 5\}$ with the transition probability matrix

$$P = \begin{pmatrix} 0 & \frac{1}{2} & \frac{1}{2} & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & \frac{1}{3} & 0 & \frac{1}{3} & \frac{1}{3} \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}.$$

Then, which of the following statements are true?

1. Stationary distribution is $(0, 0, 0, 0, 1)$.
2. State 5 is absorbing and recurrent.
3. All states are aperiodic.
4. $\lim_{n\to\infty} p_{55}^{(n)} = 1$.

Question Number : 105 Question Id : 562954180 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

अवस्था समष्टि $\{1, 2, 3, 4, 5\}$ पर निम्न संक्रमण प्रायिकता आव्यूह वाली मार्कोव श्रृंखला $\{X_n : n \geq 1\}$ पर विचार करें

$$P = \begin{pmatrix} 0 & \frac{1}{2} & \frac{1}{2} & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & \frac{1}{3} & 0 & \frac{1}{3} & \frac{1}{3} \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}.$$

तब निम्न वक्तव्यों मे से कौन से सत्य हैं?

1. स्तब्ध बंटन $(0, 0, 0, 0, 1)$ है।
2. अवस्था 5 अवशोषी तथा पुनरावर्ती है।
3. सभी अवस्थायें अनावर्ती हैं।
4. $\lim_{n\to\infty} p_{55}^{(n)} = 1$.

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Question Number : 106 Question Id : 562954181 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $X_1, X_2, \ldots$ be a sequence of independent and identically distributed random variables with $E(X_1) = 0$, $E(X_1^2) = 1$, $E(X_1^3) = 0$, $E(X_1^4) = 3$. Let $S_n = \sum_{i=1}^n X_i$, $T_n = \sum_{i=1}^n X_i^2$, $U_n = \sum_{i=1}^n X_i^3$ and $V_n = \sum_{i=1}^n X_i^4$. Then, which of the following statements are true?

1. $\dfrac{S_n}{\sqrt{n}}$ converges in distribution to a random variable Z, where $Z \sim N(0,1)$
2. $\dfrac{T_n - n}{\sqrt{3n}}$ converges in distribution to a random variable Z, where $Z \sim N(0,1)$
3. $\dfrac{\sqrt{n}S_n}{T_n}$ converges in distribution to a random variable Z, where $Z \sim N(0,1)$
4. $\dfrac{T_n - n}{\sqrt{V_n}}$ converges in distribution to a random variable Z, where $Z \sim N(0,1)$

Question Number : 106 Question Id : 562954181 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $X_1, X_2, \ldots$ ऐसे स्वतंत्र तथा एकसमानतः बंटित यादृच्छिक चरों का अनुक्रम है जिनके लिए $E(X_1) = 0$, $E(X_1^2) = 1$, $E(X_1^3) = 0$, $E(X_1^4) = 3$. मानें कि $S_n = \sum_{i=1}^n X_i$, $T_n = \sum_{i=1}^n X_i^2$, $U_n = \sum_{i=1}^n X_i^3$ तथा $V_n = \sum_{i=1}^n X_i^4$. तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $\dfrac{S_n}{\sqrt{n}}$, यादृच्छिक चर Z को बंटन में अभिसरित होता है, जहाँ $Z \sim N(0,1)$
2. $\dfrac{T_n - n}{\sqrt{3n}}$, यादृच्छिक चर Z को बंटन में अभिसरित होता है, जहाँ $Z \sim N(0,1)$
3. $\dfrac{\sqrt{n}S_n}{T_n}$, यादृच्छिक चर Z को बंटन में अभिसरित होता है, जहाँ $Z \sim N(0,1)$
4. $\dfrac{T_n - n}{\sqrt{V_n}}$, यादृच्छिक चर Z को बंटन में अभिसरित होता है, जहाँ $Z \sim N(0,1)$

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Question Number : 107 Question Id : 562954182 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let X and Y be independent and identically distributed $N(0,1)$ random variables. Let $S = X^2 + Y^2$ and $T = e^{-(X^2+Y^2)/2}$. Then, which of the following statements are true?

1. The probability density function of S is

$$f_S(s) = \begin{cases} \frac{1}{2}e^{-s/2}, & \text{if } s > 0, \\ 0, & \text{otherwise.} \end{cases}$$

2. The probability density function of T is

$$f_T(t) = \begin{cases} 1, & \text{if } 0 < t < 1, \\ 0, & \text{otherwise.} \end{cases}$$

3. $\text{Var}(S) = 2.$
4. $E(T) = \frac{2}{3}$

Question Number : 107 Question Id : 562954182 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि X तथा Y स्वतंत्र तथा सर्वथासमानत: बंटित $N(0,1)$ यादृच्छिक चर हैं। मानें कि $S = X^2 + Y^2$ तथा $T = e^{-(X^2+Y^2)/2}$. तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. S का प्रायिकता घनत्व फलन है

$$f_S(s) = \begin{cases} \frac{1}{2}e^{-s/2}, & \text{यदि } s > 0, \\ 0, & \text{अन्यथा ।} \end{cases}$$

2. T का प्रायिकता घनत्व फलन है

$$f_T(t) = \begin{cases} 1, & \text{यदि } 0 < t < 1, \\ 0, & \text{अन्यथा ।} \end{cases}$$

3. $\text{Var}(S) = 2.$
4. $E(T) = \frac{2}{3}$

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Question Number : 108 Question Id : 562954183 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $(X_1, Y_1), (X_2, Y_2), \ldots, (X_{10}, Y_{10})$ be a random sample from a bivariate normal distribution BVN$(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ with $\mu_1 = 5$, $\mu_2 = 6$, $\sigma_1^2 = 4$, $\sigma_2^2 = 9$ and $\rho = \frac{1}{2}$. Then, which of the following statements are true?

1. The distribution of $\frac{1}{\sqrt{7}} \sum_{i=1}^{10} (X_i - Y_i + 1)$ is $N(0, 10)$
2. The distribution of $\frac{1}{19} \sum_{i=1}^{10} (X_i + Y_i - 11)^2$ is χ^2-distribution with degrees of freedom 10
3. The distribution of $\dfrac{2\sqrt{2}(X_1 - 5)}{\sqrt{\sum_{i=3}^{10} (X_i - 5)^2}}$ is t-distribution with degrees of freedom 9
4. The distribution of $\dfrac{2\sum_{i=1}^{3} (Y_i - 6)^2}{\sum_{i=4}^{9} (Y_i - 6)^2}$ is F-distribution with degrees of freedom 3 and 6.

Question Number : 108 Question Id : 562954183 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $(X_1, Y_1), (X_2, Y_2), \ldots, (X_{10}, Y_{10})$ किसी द्विचर प्रसामान्य बंटन BVN$(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ में से यादृच्छिक प्रतिदर्श है जिनके लिए $\mu_1 = 5$, $\mu_2 = 6$, $\sigma_1^2 = 4$, $\sigma_2^2 = 9$ तथा $\rho = \frac{1}{2}$.

तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $\frac{1}{\sqrt{7}} \sum_{i=1}^{10} (X_i - Y_i + 1)$ का बंटन $N(0, 10)$ है
2. $\frac{1}{19} \sum_{i=1}^{10} (X_i + Y_i - 11)^2$ का बंटन स्वातंत्र्य कोटि 10 के साथ χ^2-बंटन है
3. $\dfrac{2\sqrt{2}(X_1 - 5)}{\sqrt{\sum_{i=3}^{10} (X_i - 5)^2}}$ का बंटन t-बंटन है जिसकी स्वातंत्र्य कोटि 9 है
4. $\dfrac{2\sum_{i=1}^{3} (Y_i - 6)^2}{\sum_{i=4}^{9} (Y_i - 6)^2}$ का बंटन F-बंटन है जिसकी स्वातंत्र्य कोटियां 3 तथा 6 हैं।

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Question Number : 109 Question Id : 562954184 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $X_1, X_2, \ldots, X_n$ be independent and identically distributed random variables with the probability density function

$$f(x|\theta) = \begin{cases} e^{-(x-\theta)}, & \text{if } x \geq \theta, \\ 0 & \text{otherwise,} \end{cases}$$

where $\theta \in \mathbb{R}$ is the unknown parameter. Further, let $Y = \min(X_1, X_2, \ldots, X_n)$. Which of the following are confidence intervals for θ with the confidence coefficient $(1-\alpha)$, where $\alpha \in (0,1)$?

1. $\left(Y + \frac{1}{n}\ln(1-\frac{\alpha}{2}), Y - \frac{1}{n}\ln(1-\frac{\alpha}{2})\right)$
2. $\left(Y + \frac{1}{2n}\ln(\alpha), Y\right)$
3. $\left(Y + \frac{2}{n}\ln(\frac{\alpha}{2}), Y + \frac{2}{n}\ln(1-\frac{\alpha}{2})\right)$
4. $\left(Y + \frac{1}{n}\ln(\frac{\alpha}{2}), Y + \frac{1}{n}\ln(1-\frac{\alpha}{2})\right)$

Question Number : 109 Question Id : 562954184 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $X_1, X_2, \ldots, X_n$ स्वतंत्र तथा सर्वथासमत: बंटित चर हैं जिनका प्रायिकता घनत्व फलन निम्न है

$$f(x|\theta) = \begin{cases} e^{-(x-\theta)}, & \text{यदि } x \geq \theta, \\ 0 & \text{अन्यथा,} \end{cases}$$

जहां $\theta \in \mathbb{R}$ अज्ञात प्राचल है। फिर, मानें कि $Y = \min(X_1, X_2, \ldots, X_n)$ है। θ के लिए विश्वास्यता गुणांक $(1-\alpha)$ वाला निम्न में से कौन सा विश्वास्यता अंतराल हैं, जहां $\alpha \in (0,1)$?

1. $\left(Y + \frac{1}{n}\ln(1-\frac{\alpha}{2}), Y - \frac{1}{n}\ln(1-\frac{\alpha}{2})\right)$
2. $\left(Y + \frac{1}{2n}\ln(\alpha), Y\right)$
3. $\left(Y + \frac{2}{n}\ln(\frac{\alpha}{2}), Y + \frac{2}{n}\ln(1-\frac{\alpha}{2})\right)$
4. $\left(Y + \frac{1}{n}\ln(\frac{\alpha}{2}), Y + \frac{1}{n}\ln(1-\frac{\alpha}{2})\right)$

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Question Number : 110 Question Id : 562954185 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $X_1, X_2, \ldots, X_n$ $(n \geq 3)$ be a random sample from the uniform distribution on the interval $(\theta_1 - \theta_2, \theta_1 + \theta_2)$, where $\theta_1 \in \mathbb{R}$ and $\theta_2 > 0$ are unknown parameters. Let $X_{(j)}$ be the j^{th} order statistic, $j = 1, 2, \ldots, n$, and let $\bar{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$. Here, $\left(X_{(1)}, X_{(n)}\right)$ is a complete and sufficient statistic for (θ_1, θ_2). Then, which of the following statements are true?

1. $\bar{X}$ is an unbiased estimator of θ_1
2. $(\bar{X} - X_{(1)})$ is an unbiased estimator of θ_2
3. $\frac{X_{(1)}+X_{(n)}}{2}$ is the uniformly minimum variance unbiased estimator of θ_1
4. $\frac{(n+1)(X_{(n)}-X_{(1)})}{2(n-1)}$ is the uniformly minimum variance unbiased estimator of θ_2

Question Number : 110 Question Id : 562954185 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $X_1, X_2, \ldots, X_n$ $(n \geq 3)$ अंतराल $(\theta_1 - \theta_2, \theta_1 + \theta_2)$ पर एक-समान बंटन में से यादृच्छिक प्रतिदर्श हैं, जहां $\theta_1 \in \mathbb{R}$ तथा $\theta_2 > 0$ अज्ञात प्राचल हैं। मानें कि $X_{(j)}$, j-वां क्रम प्रतिदर्शज है, जहाँ $j = 1, 2, \ldots, n$, तथा मानें $\bar{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$. $\left(X_{(1)}, X_{(n)}\right)$ यहां, (θ_1, θ_2) के लिए पूर्ण तथा पर्याप्त प्रतिदर्शज है। तब, निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $\bar{X}$, θ_1 का अनभिनत आकलक है
2. $(\bar{X} - X_{(1)})$, θ_2 का अनभिनत आकलक है
3. $\frac{X_{(1)}+X_{(n)}}{2}$, θ_1 का एक-समानत: न्यूनतम प्रसरण अनभिनत आकलक है
4. $\frac{(n+1)(X_{(n)}-X_{(1)})}{2(n-1)}$, θ_2 का एक-समानत: न्यूनतम प्रसरण अनभिनत आकलक है

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Question Number : 111 Question Id : 562954186 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $X_1, X_2, \ldots, X_n$ $(n \geq 2)$ be a random sample from a continuous distribution with the probability density function

$$f(x|\theta) = \frac{1}{2\theta} e^{-\frac{|x-\theta|}{\theta}}, \quad x \in \mathbb{R},$$

where $\theta\,(> 0)$ is an unknown parameter. Let $U_n = \frac{1}{n}\sum_{i=1}^{n} X_i$, $V_n = \frac{1}{n}\sum_{i=1}^{n} X_i^2$, and $S_n^2 = \frac{1}{n-1}\sum_{i=1}^{n}(X_i - U_n)^2$. Then, which of the following statements are true?

1. U_n is an unbiased estimator of θ
2. S_n^2 is an unbiased estimator of θ^2
3. $\frac{1}{3}V_n$ is a consistent estimator of θ^2
4. The statistic (U_n, V_n) is complete

Question Number : 111 Question Id : 562954186 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $X_1, X_2, \ldots, X_n$ $(n \geq 2)$ निम्न प्रायिकता घनत्व फलन वाले संतत बंटन में से यादृच्छिक प्रतिदर्श है

$$f(x|\theta) = \frac{1}{2\theta} e^{-\frac{|x-\theta|}{\theta}}, \quad x \in \mathbb{R},$$

जहां $\theta\,(> 0)$ एक अज्ञात प्राचल है। मानें कि $U_n = \frac{1}{n}\sum_{i=1}^{n} X_i$, $V_n = \frac{1}{n}\sum_{i=1}^{n} X_i^2$, तथा $S_n^2 = \frac{1}{n-1}\sum_{i=1}^{n}(X_i - U_n)^2$. तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. θ का अनभिनत आकलक U_n है
2. θ^2 का अनभिनत आकलक S_n^2 है
3. θ^2 का अविरोधी आकलक $\frac{1}{3}V_n$ है
4. प्रतिदर्शज (U_n, V_n) पूर्ण है

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Question Number : 112 Question Id : 562954187 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let X be a random sample of size one from the probability density function

$$f(x|\theta) = \begin{cases} \theta e^{-\theta(x-1)}, & \text{if } x > 1, \\ 0, & \text{otherwise,} \end{cases}$$

where $\theta\,(>\;0)$ is the unknown parameter. Suppose we want to test the null hypothesis $H_0 : \theta = 1$ against the alternative hypothesis $H_1 : \theta \neq 1$, based on the observed value x of X. Then, which of the following statements are true?

1. The likelihood function is maximized at $\theta = \frac{1}{x-1}$
2. The maximum value of the likelihood function is $\frac{e^{-1}}{x-1}$
3. The likelihood ratio test for testing H_0 against H_1 rejects H_0 if $(x-1)e^{-x} < k$, for some $k > 0$
4. The likelihood ratio test for testing H_0 against H_1 rejects H_0 if $x > c$, for some $c > 1$

Question Number : 112 Question Id : 562954187 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि X निम्न प्रायकिता घनत्व फलन में से आमाप एक का यादृच्छिक प्रतिदर्श है

$$f(x|\theta) = \begin{cases} \theta e^{-\theta(x-1)}, & \text{यदि } x > 1, \\ 0, & \text{अन्यथा,} \end{cases}$$

जहां $\theta\,(> 0)$ अज्ञात प्राचल है। मानें कि हम X के प्रेक्षित मान x के आधार पर निराकरणीय परिकल्पना $H_0 : \theta = 1$ को वैकल्पिक परिकल्पना $H_1 : \theta \neq 1$ के विरूद्ध परीक्षित करना चाहते हैं। तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. संभाविता फलन $\theta = \frac{1}{x-1}$ पर अधिकतमीकृत है
2. संभाविता फलन का अधिकतम मान $\frac{e^{-1}}{x-1}$ है
3. H_1 के विरूद्ध H_0 के परीक्षण के लिए संभाविता अनुपात परीक्षण, H_0 को अस्वीकार करता है यदि किसी $k > 0$ के लिए, $(x-1)e^{-x} < k$
4. H_1 के विरूद्ध H_0 के परीक्षण के लिए संभाविता अनुपात परीक्षण, H_0 को अस्वीकार करता है यदि किसी $c > 1$ के लिए, $x > c$

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Question Number : 113 Question Id : 562954188 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $(X_1, X_2, \ldots, X_7)$ and $(Y_1, Y_2, \ldots, Y_9)$ be two independent random samples from the continuous distribution functions $F(x-\mu)$ and $F(x-\theta)$, respectively, where F, μ and θ are all unknown. Further, let μ be the unique median of $F(x-\mu)$ and θ be the unique median of $F(x-\theta)$. Let R_i be the rank of Y_i in the combined sample, $i = 1, 2, \ldots, 9$. For testing $H_0 : \mu = \theta$ against $H_1 : \mu > \theta$, the test statistic $T = \sum_{i=1}^{9} R_i$ is proposed. Then, which of the following statements are true?

1. The maximum possible value of T is 115
2. Right-tailed test based on T is appropriate for testing H_0 against H_1
3. Under H_0, $E(T) = 76$
4. Under H_0, $P(R_1 = 1, R_9 = 16) = \frac{1}{240}$

Question Number : 113 Question Id : 562954188 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि $(X_1, X_2, \ldots, X_7)$ तथा $(Y_1, Y_2, \ldots, Y_9)$ क्रमशः संतत बंटन फलनों $F(x-\mu)$ तथा $F(x-\theta)$ में से दो स्वतंत्र यादृच्छिक प्रतिदर्श हैं, जहां F, μ तथा θ सभी अज्ञात हैं। फिर, μ को $F(x-\mu)$ की अद्‌वितीय माध्यिका तथा θ को $F(x-\theta)$ की अद्‌वितीय माध्यिका मानें। मानें कि $i = 1, 2, \ldots, 9$ के लिए संयुक्त प्रतिदर्श में Y_i की कोटि R_i है। $H_1 : \mu > \theta$ के विरूद्‌ध $H_0 : \mu = \theta$ का परीक्षण करने के लिए, परीक्षण प्रतिदर्शज $T = \sum_{i=1}^{9} R_i$ प्रस्तावित किया गया है। तब निम्न वक्तव्यों में कौन से सत्य हैं?

1. T का अधिकतम संभव मान 115 है
2. T पर आधारित Right-tailed परीक्षण H_1 के विरूद्‌ध H_0 के परीक्षण के लिए उपयुक्त है
3. H_0 के अधीन, $E(T) = 76$
4. H_0 के अधीन, $P(R_1 = 1, R_9 = 16) = \frac{1}{240}$

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Question Number : 114 Question Id : 562954189 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let $X_1, X_2, \ldots, X_n$ be a random sample from $N(\theta, 1), \theta \in \mathbb{R}$. If $\hat{\theta}$ is the Bayes estimator of θ with respect to some prior $\pi(\theta)$ and loss function $L(\theta, d)$. Then, which of the following statements are true?

1. $\hat{\theta} = \frac{\sum_{i=1}^n X_i}{n+\tau^2}$, if the prior is $N(0, \frac{1}{\tau^2})$, τ^2 known and $L(\theta, d) = (\theta - d)^2$
2. $\hat{\theta} = \frac{\sum_{i=1}^n X_i}{n+\tau^2}$, if the prior is $N(0, \tau^2)$, τ^2 known and $L(\theta, d) = |\theta - d|$
3. $\hat{\theta} = \frac{\sum_{i=1}^n X_i}{n+\frac{1}{\tau^2}}$, if the prior is $N(0, \frac{1}{\tau^2})$, τ^2 known and $L(\theta, d) = |\theta - d|$
4. $\hat{\theta} = \frac{\sum_{i=1}^n X_i}{n}$, if the prior is the Jeffreys prior and $L(\theta, d) = (\theta - d)^2$

Question Number : 114 Question Id : 562954189 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$X_1, X_2, \ldots, X_n$ को $N(\theta, 1),\ \theta \in \mathbb{R}$ से लिया गया यादृच्छिक प्रतिदर्श मानें। यदि $\widehat{\theta}$ किसी पूर्व (prior) $\pi(\theta)$ तथा हानि-फलन $L(\theta, d)$ के सापेक्ष θ का बेज़ आकलक है। तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $\widehat{\theta} = \frac{\sum_{i=1}^n X_i}{n+\tau^2}$, यदि पूर्व $N(0, \frac{1}{\tau^2})$ है, τ^2 ज्ञात है तथा $L(\theta, d) = (\theta - d)^2$
2. $\widehat{\theta} = \frac{\sum_{i=1}^n X_i}{n+\tau^2}$, यदि पूर्व $N(0, \tau^2)$ है, τ^2 ज्ञात है तथा $L(\theta, d) = |\theta - d|$
3. $\widehat{\theta} = \frac{\sum_{i=1}^n X_i}{n+\frac{1}{\tau^2}}$, यदि पूर्व $N(0, \frac{1}{\tau^2})$ है, τ^2 ज्ञात है तथा $L(\theta, d) = |\theta - d|$
4. $\widehat{\theta} = \frac{\sum_{i=1}^n X_i}{n}$, यदि पूर्व जेफ्रीज़ पूर्व है तथा $L(\theta, d) = (\theta - d)^2$

Question Number : 115 Question Id : 562954190 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Consider a paired data $(x_i, y_i); i = 1, 2, 3, 4, 5$, where $(x_1, x_2, x_3, x_4, x_5) = (-2, -1, 0, 1, 2)$ and $y_i = x_i^2$ for all $i = 1, 2, 3, 4, 5$. On this data, a simple linear regression model with an intercept term and a simple linear regression model without an intercept term are fitted using the method of least squares. Which of the following statements are true ?

1. The two fitted lines have the same slope
2. The two fitted models have the same intercept
3. The model with intercept passes through at least one of the observed data points
4. The model without intercept passes through at lesast one of the observed data points

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Question Number : 115 Question Id : 562954190 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

युगलित आंकड़ों $(x_i, y_i)\,; i = 1, 2, 3, 4, 5,$ पर विचार करें जहां $(x_1, x_2, x_3, x_4, x_5) = (-2, -1, 0, 1, 2)$ तथा सभी $i = 1, 2, 3, 4, 5$ के लिए $y_i = x_i^2$. इन आंकड़ों को अंत:खंड के साथ एक सरल रैखिक समाश्रयण मॉडल तथा बिना अंत:खंड के एक सरल रैखिक समाश्रयण मॉडल का उपयोग करके न्यूनतम वर्ग विधि से आसंजित किया जाता है। निम्न वक्तव्यों में से कौन से सत्य हैं?

1. दोनों आसंजित रेखाओं की समान प्रवणता हैं
2. दोनों आंसजित मॉडल के समान अंत:खंड हैं
3. अंत:खड वाला मॉडल कम से कम एक प्रेक्षित बिंदु से होकर जाता है
4. बिना अंत:खंड वाला मॉडल कम से कम एक प्रेक्षित बिंदु से होकर जाता है

Question Number : 116 Question Id : 562954191 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

An analyst fits a multiple linear regression model $Y_i = \beta_0 + \beta_1 X_{1i} + \cdots + \beta_4 X_{4i} + \epsilon_i,\ i = 1, 2, \ldots, n$, using the method of least squares. However, his coordinator insists that the intercept and two regressors $Z_1 = X_1 + X_3$ and $Z_2 = X_2 - X_4$ are enough to represent the model. Suppose the coordinator's claim can be tested in the form of a general linear hypothesis, viz., $H_0 : L^T\beta = 0$ against $H_A : H_0$ is not true, where $\beta^T = (\beta_0, \beta_1, \ldots, \beta_4)$. Suppose we have n observations on the response Y and each regressor. Further, assume that the errors with or without restrictions are independent $N(0, \sigma^2)$ variables. Then, which of the following statements are true?

1. A possible choice of L is $\begin{pmatrix} 0 & 0 \\ 1 & 0 \\ 0 & 1 \\ -1 & 0 \\ 0 & 1 \end{pmatrix}$
2. The test statistic for testing H_0 against H_A follows an F-distribution with $(2, n-4)$ degrees of freedom under H_0
3. Sum of squares residuals under the restrictions $L^T\beta = 0$ follows $\sigma^2\chi^2_{n-3}$ distribution
4. Sum of squares residuals without the restrictions $L^T\beta = 0$ follows a non-central $\sigma^2\chi^2_{n-4}$ distribution

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Question Number : 116 Question Id : 562954191 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

एक विश्लेषक, न्यूनतम वर्ग विधि का उपयोग करते हुए बहु-रैखिक समाश्रयण मॉडल $Y_i = \beta_0 + \beta_1 X_{1i} + \cdots + \beta_4 X_{4i} + \epsilon_i,\ i = 1, 2, \ldots, n$, आसंजित करता है। उसका समन्वयक इस दृढ़ मत का हैं कि अत:खंड तथा दो समाश्रयी $Z_1 = X_1 + X_3$ तथा $Z_2 = X_2 - X_4$ मॉडल के प्रतिनिधित्व के लिए पर्याप्त हैं। मानें कि समन्वयक का दावा व्यापक रैखिक परिकल्पना (जबकि $H_0 : L^T\beta = 0$ है) $H_A : H_0$ सत्य नहीं है, जहाँ $\beta^T = (\beta_0, \beta_1, \ldots, \beta_4)$; H_0 के विरुद्ध परीक्षणीय है। मानें कि हमारे पास उत्तर Y व प्रत्येक समाश्रयी के लिए n प्रेक्षण हैं। फिर, मानें कि प्रतिबंधों के साथ या उनके बिना, त्रुटियां स्वतंत्र $N(0, \sigma^2)$ चर हैं। तब निम्न वक्तव्यों में से कौन से सत्य हैं ?

1. L के लिए एक संभावना $\begin{pmatrix} 0 & 0 \\ 1 & 0 \\ 0 & 1 \\ -1 & 0 \\ 0 & 1 \end{pmatrix}$ है
2. H_A के विरूद्ध H_0 के परीक्षण के लिए, परीक्षण प्रतिदर्शज ऐसे F-बंटन का अनुसरण करता है जिसकी H_0 के अधीन $(2, n-4)$ स्वातंत्र्य कोटि हैं
3. प्रतिबंध $L^T\beta = 0$ के अधीन, वर्ग-शेषों का योग $\sigma^2\chi^2_{n-3}$ बंटन का अनुसरण करता है
4. बिना प्रतिबंध $L^T\beta = 0$ के अधीन, वर्ग-शेषों का योग अकेंद्रीय $\sigma^2\chi^2_{n-4}$ बंटन का अनुसरण करता है

Question Number : 117 Question Id : 562954192 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Let the random vector $\begin{pmatrix} X_1 \\ X_2 \\ X_3 \end{pmatrix}$ have the positive definite dispersion matrix $\begin{pmatrix} 1 & \rho & \rho \\ \rho & 1 & \rho \\ \rho & \rho & 1 \end{pmatrix}$. Then, which of the following statements are true?

1. ρ may be -0.47
2. The first principal component can only explain 32% of the total variation for some ρ
3. The second principal component can explain more than 32% of the total variation for any ρ
4. The variance of the first principal component is $1 + 2\rho$ for any ρ

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Question Number : 117 Question Id : 562954192 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

मानें कि यादृच्छिक सदिश $\begin{pmatrix} X_1 \\ X_2 \\ X_3 \end{pmatrix}$ का धनात्मक निश्चित परिक्षेपण आव्यूह $\begin{pmatrix} 1 & \rho & \rho \\ \rho & 1 & \rho \\ \rho & \rho & 1 \end{pmatrix}$ है। तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. ρ, -0.47 हो सकता है
2. कुछ ρ के लिए, प्रथम मुख्य घटक कुल विचरण के 32% की ही व्याख्या कर सकता है
3. किसी भी ρ के लिए, द्वितीय मुख्य घटक कुल विचरण के 32% से अधिक की व्याख्या कर सकता है
4. किसी भी ρ के लिए, प्रथम मुख्य घटक का प्रसरण $1 + 2\rho$ है

Question Number : 118 Question Id : 562954193 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

If the incidence matrix of a block design is given by $N = \begin{bmatrix} 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}$, then which of the following statements are true?

1. The design is incomplete
2. The design is connected
3. The design is balanced
4. The design is orthogonal

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Question Number : 118 Question Id : 562954193 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

यदि किसी ब्लॉक डिज़ाइन का आपतन आव्यूह (incidence matrix) $N = \begin{bmatrix} 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}$ है, तब निम्न वक्तव्यों में से कौन से सत्य है?

1. डिज़ाईन अपूर्ण है
2. डिज़ाईन सम्बद्ध है
3. डिज़ाईन संतुलित है
4. डिज़ाईन लांबिक है

Question Number : 119 Question Id : 562954194 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

A system has two components C_1 and C_2 put in parallel. The components C_1 and C_2 have independent lifetimes X_1 and X_2, respectively. The probability distribution of X_j is exponential with mean $\frac{1}{j}$, $j = 1, 2$. Suppose that $R(t)$ and $h(t)$ are the reliability and the hazard rate functions of the system, respectively. Then, which of the following statements are true?

1. $R(t) = e^{-2t} + e^{-t} - e^{-3t},\ t > 0$
2. The expected lifetime of the given system is 1
3. $h(1) = \dfrac{2e + e^2 - 3}{e + e^2 - 1}$
4. $h(3) = \dfrac{4e^3 + e^6 - 5}{e^3 + e^6 - 1}$

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Question Number : 119 Question Id : 562954194 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

किसी निकाय के दो घटक C_1 तथा C_2 समांतर में रखे गये हैं। C_1 तथा C_2 के स्वतंत्र जीवनकाल क्रमशः X_1 तथा X_2 हैं। X_j का प्रायिकता बंटन चरघातांकी है जिसका माध्य $\frac{1}{j}$, $j = 1, 2$ है। मानें कि $R(t)$ तथा $h(t)$ निकाय के क्रमशः विश्वसनीयता तथा संकट दर (hazard rate) फलन हैं। तब निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $R(t) = e^{-2t} + e^{-t} - e^{-3t},\ t > 0$
2. दिए गए निकाय का अपेक्षित जीवनकाल 1 है
3. $h(1) = \dfrac{2e + e^2 - 3}{e + e^2 - 1}$
4. $h(3) = \dfrac{4e^3 + e^6 - 5}{e^3 + e^6 - 1}$

Question Number : 120 Question Id : 562954195 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No
Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

Consider the $M/M/1$ queue in which customers arrive according to a Poisson process with rate 3 and successive service times are independent exponential random variables having mean $\dfrac{1}{9}$. Let P_n be the long run probability that there are exactly n customers in the system. Then, which of the following statements are true?

1. $P_0 = \dfrac{1}{3}$
2. $P_1 = \dfrac{2}{9}$
3. The average number of customers in the system is 1
4. The average amount of time that a customer spends in the system is $\dfrac{1}{6}$

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Question Number : 120 Question Id : 562954195 Question Type : MSQ Option Shuffling : No Display Question Number : Yes Is Question Mandatory : No Calculator : Yes Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes Time interval to replay(In Seconds) : 0 Allow Volume Control : No

Correct Marks : 4.75 Wrong Marks : 0 Max. Selectable Options : 0

$M/M/1$ पंक्ति पर विचार करें जिसमें ग्राहक प्वासों प्रक्रिया के अनुसार दर 3 से आते हैं तथा क्रमिक सेवा अवधियां स्वतंत्र चरघांताकी यादृच्छिक चर हैं जिनका माध्य $\frac{1}{9}$ है। मानें कि प्रणाली में यथातथ n ग्राहकों के होने की दीर्घकालिक प्रायिकता P_n है। तब, निम्न वक्तव्यों में से कौन से सत्य हैं?

1. $P_0 = \frac{1}{3}$
2. $P_1 = \frac{2}{9}$
3. प्रणाली ग्राहकों की औसत संख्या 1 है
4. प्रणाली में ग्राहक द्वारा बिताया गया औसत समय $\frac{1}{6}$ है

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