Section A: Internal choice has been provided in two questions of two marks each, two questions of four marks each and two questions of six m ırks each.
Section B: Internal choice has been provided in one questio.. o. two ma.. ..d one question of four marks.
Section C: Internal choice has been provided in one question of two marks and one question of four marks.
All working, including rough work, should be done on the same sheet as, and adjacent to the rest of the answer.
The intended marks for questions or parts of questions are given in brackets [ ].
Mathematical tables and graph papers are provided.

SECTION A - 65 MARKS

Question 1

In subparts (i) to (x) choose the correct options and in subparts (xi) to (xv), answer the questions as instructed.

(i) Let L be a set of all straight lines in a plane. The relation R on L defined as 'perpendicular to' is: [1]

(a) Symmetric and Transitive

(b) Transitive

(c) Symmetric

(d) Equivalence

(ii) The order and the degree of differential equation $1 + \left(\frac{dy}{dx}\right)^2 = \frac{d^2y}{dx^2}$ are: [1]

(a) 2 and $\frac{3}{2}$

(b) 2 and 3

(c) 3 and 4

(d) 2 and 1

This Paper consists of 12 printed pages.

1224-860

Turn over

$A = \{a, b\}$ $\quad I = \{(a,a), (b,b)\}$

$R = \{(a,a), (b,b), (a,b)\}$

(iii) Let A be a non-empty set. **[1]**

Statement 1: Identity relation on A is Reflexive.
Statement 2: Every Reflexive relation on A is an Identity relation.

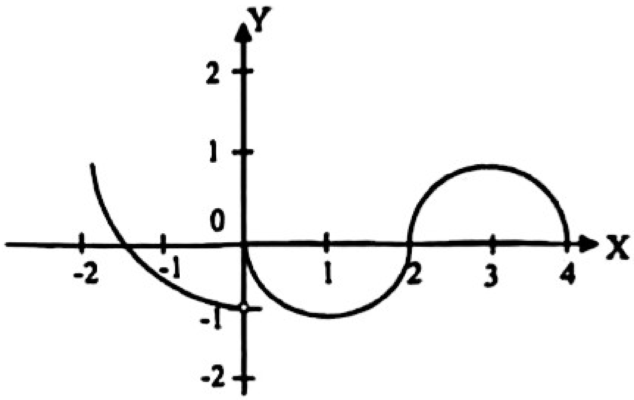
(a) Both the statements are true.

(b) Both the statements are false.

(c) Statement 1 is true and Statement 2 is false.

(d) Statement 1 is false and Statement 2 is true.

(iv) The graph of the function f is shown below. **[1]**



Of the following options, at what values of x is the function f **NOT** differentiable?

(a) At $x = 0$ and $x = 2$

(b) At $x = 1$ and $x = 3$

(c) At $x = -1$ and $x = 1$

(d) At $x = -1{\cdot}5$ and $x = 1{\cdot}5$

(v) The value of $\operatorname{cosec}\left(\sin^{-1}\left(\frac{-1}{2}\right)\right) - \sec\left(\cos^{-1}\left(\frac{-1}{2}\right)\right)$ is equal to: **[1]**

(a) -4

(b) 0

(c) -1

(d) 4

$\operatorname{cosec}(\operatorname{cosec}^{-1}(-2)) - \sec(\sec^{-1}(-2))$

$= -2 - (-2)$

$= -2 + 2$

$= 0$

(vi) The value of $\int_1^{\sqrt{3}} \frac{dx}{1+x^2}$ is: [1]

$\left[\tan^{-1}x\right]_1^{\sqrt{3}}$

$\tan^{-1}\sqrt{3} - \tan^{-1}1$

$\frac{\pi}{3} - \frac{\pi}{4}$

$\frac{4\pi - 3\pi}{12} = \frac{\pi}{12}$.

(a) $\frac{\pi}{2}$

(b) $\frac{2\pi}{3}$

(c) $\frac{\pi}{6}$

(d) $\frac{\pi}{12}$

(vii) **Assertion:** Let the matrices $A = \begin{pmatrix} -3 & 2 \\ -5 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & -2 \\ 5 & -3 \end{pmatrix}$ be such that $A^{100}B = BA^{100}$ [1]

Reason: AB = BA implies $A^nB = BA^n$ for all positive integers n.

$A \cdot B = B \cdot A = I$

So, $A^{100}B$

$A^{99} \cdot AB$

$A^{99} I$

A^{99}

BA^{100}

BAA^{99}

$I \cdot A^{99}$

A^{99}

(a) Both Assertion and Reason are true and Reason is the correct explanation for Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation for Assertion.

(c) Assertion is true and Reason is false.

(d) Assertion is false and Reason is true.

(viii) If $\int (\cot x - \operatorname{cosec}^2 x) e^x dx = e^x f(x) + c$ then $f(x)$ will be: [1]

$\int \cot x \, e^x - \int \operatorname{cosec}^2 x \, e^x dx.$

$\int \cot x . e^x - \left[-e^x . \cot x - \int -\cot x \, e^x dx \right]$

$\int \cot x . e^x + e^x . \cot x - \int e^x \cot x \, dx$

(a) $\cot x + \operatorname{cosec} x$

(b) $\cot^2 x$

(c) $\cot x$

(d) $\operatorname{cosec} x$

(ix) In which one of the following intervals is the function $f(x) = x^3 - 12x$ increasing? [1]

$f'(x) = 3x^2 - 12$

$= 3(x^2 - 4) > 0$

$(x+2)(x-2) > 0$

x

(a) $(-2, 2)$

(b) $(-\infty, -2) \cup (2, \infty)$

(c) $(-2, \infty)$

(d) $(-\infty, 2)$

(x) If A and B are symmetric matrices of the same order, then AB – BA is: [1]

(a) Skew – symmetric matrix

(b) Symmetric matrix

(c) Diagonal matrix

(d) Identity matrix

$\frac{dy}{dx}, \frac{1}{x} - \frac{1}{x^2}$

(xi) Find the derivative of $y = \log x + \frac{1}{x}$ with respect to x. [1]

(xii) Teena is practising for an upcoming Rifle Shooting tournament. The probability of her shooting the target in the 1st, 2nd, 3rd and 4th shots are 0·4, 0·3, 0·2 and 0·1 respectively. Find the probability of at least one shot of Teena hitting the target. [1]

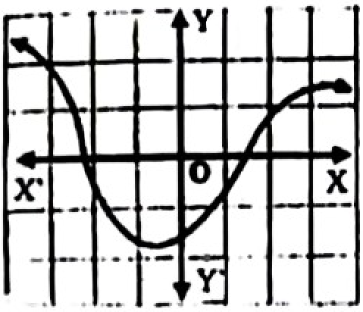
$P(\bar{A}\bar{B}\bar{C}\bar{D}) = 0.6 \times 0.7 \times 0.8 \dots$

(xiii) Which one of the following graphs is a function of x? [1]

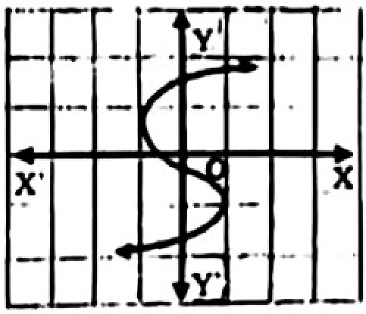
atleast $P(E) = 1 - 0.3024$

0.6976

for all (domain) x there are Unique solution



Graph A ✓



Graph B

(xiv) Evaluate: $\int_0^6 |x+3|\, dx$ [1]

$[x^2 + 3x]_0^6 = 54$

(xv) Given that $\frac{1}{y} + \frac{1}{x} = \frac{1}{12}$ and y decreases at a rate of 1 cms^{-1}, find the rate of change of x when $x = 5$ cm and $y = 1$ cm [1]

$\frac{-1}{y^2}\frac{dy}{dt} - \frac{1}{x^2}\frac{dx}{dt} = 0$

$\frac{-1}{1} \times -1 = \frac{1}{5^2}\frac{dx}{dt}$

$\frac{dx}{dt} = 25\, cm/s$

Question 2

domain   Range

(i) Let $f: R - \left\{\frac{-1}{3}\right\} \rightarrow R - \{0\}$ be defined as $f(x) = \frac{5}{3x+1}$ is invertible. Find $f^{-1}(x)$

$y = \frac{5}{3x+1}$ | $3xy + y = 5$, $3xy = 5 - y$, $x = \frac{5-y}{3y}$

OR

(ii) If $f: R \rightarrow R$ is defined by $f(x) = \frac{2x-7}{4}$, show that $f(x)$ is one - one and onto.

put a & $b \in R$.

$f(a) = f(b)$

$\frac{3a-7}{4} = \frac{3b-7}{4}$ | $3a - 7 = 3b - 7$, $3a = 3b$, $a = b$. One-One

$y = \frac{2x-7}{4}$, $4y + 7 = 2x$, $x = \frac{4y+7}{2}$

Onto

$f^{-1}(y) = \dots$ [2]

$f^{-1}(x) = \frac{5}{3x} - \dots$

or

$f^{-1}(x) = \frac{5-x}{x}$

Question 3

Find the value of the determinant given below, without expanding it at any stage.

$$\begin{vmatrix} \beta\gamma & 1 & \alpha(\beta+\gamma) \\ \gamma\alpha & 1 & \beta(\gamma+\alpha) \\ \alpha\beta & 1 & \gamma(\alpha+\beta) \end{vmatrix}$$

$$\begin{vmatrix} \beta\gamma & 1 & \alpha\beta + \alpha\gamma \\ \gamma\alpha & 1 & \beta\gamma + \alpha\beta \\ \alpha\beta & 1 & \gamma\alpha + \gamma\beta \end{vmatrix}$$

$C_1 \rightarrow C_1 + C_3$

$$\begin{vmatrix} \alpha\beta + \beta\gamma + \alpha\gamma & 1 & \alpha\beta + \alpha\gamma \\ \alpha\beta + \beta\gamma + \alpha\gamma & 1 & \beta\gamma + \alpha\beta \\ \alpha\beta + \beta\gamma + \alpha\gamma & 1 & \gamma\alpha + \gamma\beta \end{vmatrix}$$

take common $\alpha\beta + \beta\gamma + \alpha\gamma$ from C_1

$\frac{dy}{dx} = \frac{1}{x} - \frac{1}{x^2}$

(xi) Find the derivative of $y = \log x + \frac{1}{x}$ with respect to x. [1]

(xii) Teena is practising for an upcoming Rifle Shooting tournament. The probability of her shooting the target in the 1st, 2nd, 3rd and 4th shots are 0·4, 0·3, 0·2 and 0·1 respectively. Find the probability of at least one shot of Teena hitting the target. [1]

$P(\bar{A}\bar{B}\bar{C}\bar{D}) = 0\cdot6 \times 0\cdot7 \times \ldots$

(xiii) Which one of the following graphs is a function of x? [1]

atleast $P(E) = 1 - 0\cdot3024$
$0\cdot6976$

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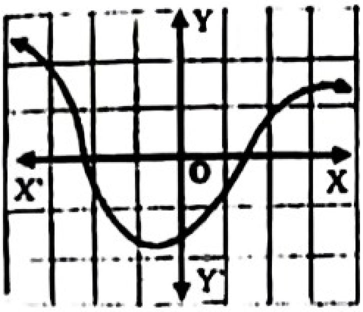
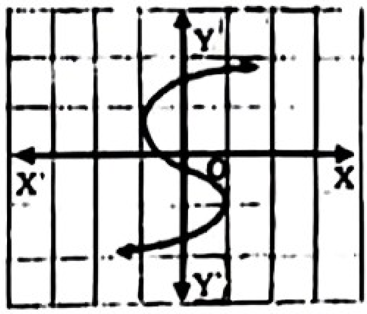


Graph A ✓



Graph B

(xiv) Evaluate: $\int_0^6 |x+3|\, dx$ [1]

$\left[x^2 + 3x\right]_0^6 = 54$

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$\frac{-1}{y^2}\frac{dy}{dt} - \frac{1}{x^2}\frac{dx}{dt} = 0$

$\frac{-1}{1} \times -1 = \frac{1}{5^2}\frac{dx}{dt}$

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Question 2 domain Range

(i) Let $f: R - \left\{\frac{-1}{3}\right\} \to R - \{0\}$ be defined as $f(x) = \frac{5}{3x+1}$ is invertible. Find $f^{-1}(x)$

$y = \frac{5}{3x+1}$ | $3xy + y = 5$, $3xy = 5 - y$, $x = \frac{5-y}{3y}$

$f^{-1}(y) = \frac{5}{3y} - 1$

$f^{-1}(x) = \frac{5}{3x} - 1$

or

$f^{-1}(x) = \frac{5-x}{x}$

OR

(ii) If $f: R \to R$ is defined by $f(x) = \frac{2x-7}{4}$, show that $f(x)$ is one - one and onto. [2]

put a & $b \in R$.

$f(a) = f(b)$

$\frac{3a-7}{4} = \frac{3b-7}{4}$ | $3a - \cancel{7} = 3b - \cancel{7}$, $3a = 3b$, $a = b$. One-One

$y = \frac{2x-7}{4}$

$4y + 7 = 2x$

$x = \frac{4y+7}{2}$

Onto

Question 3

Find the value of the determinant given below, without expanding it at any stage.

$$\begin{vmatrix} \beta\gamma & 1 & \alpha(\beta+\gamma) \\ \gamma\alpha & 1 & \beta(\gamma+\alpha) \\ \alpha\beta & 1 & \gamma(\alpha+\beta) \end{vmatrix}$$

Question 4

(i) Determine the value of k for which the following function is continuous at $x = 3$.

$$f(x) = \begin{cases} \dfrac{(x+3)^2 - 36}{x-3} & ; \; x \neq 3 \\ k & ; \; x = 3 \end{cases}$$

LHL = RHL

$K = \lim_{x\to 3} \frac{(x+3)^2 - 36}{x-3}$

$\lim_{x\to 3} \frac{(x+3)^2 - 6^2}{x-3}$

$\lim_{x\to 3} \frac{(x+3-6)(x+3+6)}{x-3}$

$\lim_{x\to 3} = x+9$

apply limit

$3+9 = 12$

$\boxed{K = 12}$

[2]

OR

(ii) Find a point on the curve $y = (x-2)^2$ at which the tangent is parallel to the line joining the chord through the points $(2,0)$ and $(4,4)$.

$\frac{dy}{dx} = 2(x-2)$ | $\cancel{2}(x-2) = \cancel{2}$ | $\boxed{x = 2}$ | point $(2,0)$

$m = \frac{4-0}{4-2} = \frac{4}{2} = 2$

[2]

Question 5

Evaluate: $\int_0^{2\pi} \frac{1}{1+e^{\sin x}} dx$ — ①

$\int_0^a f(x)dx = \int_0^a f(a-x)dx$

$I = \int_0^{2\pi} \frac{dx}{1+e^{\sin(2\pi - x)}} = \int_0^{2\pi} \frac{dx}{1+e^{-\sin x}}$

$= \int_0^{2\pi} \frac{dx}{1+\frac{1}{e^{\sin x}}} = \int_0^{2\pi} \frac{e^{\sin x}\,dx}{e^{\sin x}+1}$ — ②

① + ②

$2I = \int \frac{1+e^{\sin x}}{1+e^{\sin x}} =$

$2I = \int 1 dx$

$2I = 2\pi$

$I = \pi$

[4]

Question 6

Evaluate: $P(A \cup B)$ if $2P(A) = P(B) = \frac{5}{13}$ and $P(A|B) = \frac{2}{5}$

$P(A|B) = \frac{P(A\cap B)}{P(B)}$

$\frac{2}{5} = \frac{P(A\cap B)}{\frac{5}{13}}$

$P(A\cap B) = \frac{2}{13}$

$P(A\cup B) = P(A) + P(B) - P(A\cap B)$

$= \frac{5}{26} + \frac{5}{13} - \frac{2}{13}$

$\frac{5+10-4}{26} = \frac{11}{26}$.

Question 7

If $y = 3\cos(\log x) + 4\sin(\log x)$, show that $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$

$\frac{dy}{dx} = \frac{-3\sin(\log x)}{x} + \frac{4\cos\log x}{x} = \frac{1}{x}[-3\sin\log x + 4\cos\log x]$

$y'' = \frac{x\left[-\frac{3\cos\log x}{x} - \frac{4\sin\log x}{x}\right] - [3\sin(\log x) \ldots]}{x^2}$

$y'' = \frac{-\sin\log x - 7\cos\log x}{x^2}$

y'' put the value in LHS.

[4]

Question 8

(i) Solve for x: $\sin^{-1}\left(\frac{x}{2}\right) + \cos^{-1}x = \frac{\pi}{6}$

8(i) $\sin^{-1}\frac{x}{2} + \frac{\pi}{2} - \sin^{-1}x$

$\sin^{-1}x - \sin^{-1}\frac{x}{2} = \frac{\pi}{2} - \frac{\pi}{6}$

$\sin^{-1}x = \frac{\pi}{3} + \sin^{-1}\frac{x}{2}$

$\sin^{-1}x = \sin^{-1}\frac{\sqrt{3}}{2} + \sin^{-1}\frac{x}{2}$

$\sin^{-1}x = \sin^{-1}\left(\frac{\sqrt{3}}{2}\sqrt{1-\frac{x^2}{4}} + \frac{x}{2}\sqrt{1-\frac{3}{4}}\right)$

$x = \frac{\sqrt{3}}{2}\frac{\sqrt{4-x^2}}{2} + \frac{x}{4}$

$3x^2 = 4 - x^2$

$x^2 = 1 \Rightarrow x = \pm 1$

OR

(ii) If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \pi$, show that $x^2 - y^2 - z^2 + 2yz\sqrt{1-x^2} = 0$

Example in S Chand Book at last

[4]

Question 9

(i) Evaluate: $\int x^2 \cos x\, dx$

At Back.

OR

Q8 (ii) $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \pi$

$\sin^{-1}x = A$, $\sin^{-1}y = B$, $\sin^{-1}z = C$

$x = \sin A$ + $y = \sin B$, $z = \sin C$

$$A + B + C = \pi$$

$$B + A = \pi - C$$

$$\sin(A+B) = \sin(\pi - C)$$

$$\cancel{\sin B \cos C + \cos B \sin C = \sin A}$$

$$\cancel{y\sqrt{1-z^2} + z\sqrt{1-y^2} = x}$$

$$\sin A \cos B + \cos A \sin B = \sin C$$

$$x\sqrt{1-y^2} + y\sqrt{1-x^2} = z.$$

$$x\sqrt{1-y^2} = z - y\sqrt{1-x^2}$$

sq. both sides.

$$x^2(1-y^2) = (z - y\sqrt{1-x^2})^2$$

$$x^2 - x^2y^2 = z^2 + y^2(1-x^2) - 2yz\sqrt{1-x^2}$$

$$x^2 - \cancel{x^2y^2} - z^2 - y^2 + \cancel{x^2y^2} + 2yz\sqrt{1-x^2} = 0.$$

Q9 (i) $I = \int x^2 \cos x \, dx.$

By parts.

$$I = x^2 \sin x - \int 2x \cdot \sin x \, dx.$$

$$I = x^2 \sin x - 2\int x \sin x \, dx.$$

$$I = x^2 \sin x - 2\left[-x\cos x + \int \cos x \, dx\right]$$

$$I = x^2 \sin x - 2\left[-x\cos x + \sin x\right] + C$$

$$I = x^2 \sin x + 2x\cos x - 2\sin x + C$$

(ii) $I = \frac{1}{2}\int \frac{2(x+7)}{x^2+4x+7} dx.$

$$I = \frac{1}{2}\int \frac{2x+4}{x^2+4x+7} \cdot \ldots dx$$

$$I = \frac{1}{2}\log(x^2+4x+7) + 10\int \frac{1}{x^2+4x+7} dx$$

$$\int \frac{1}{x^2+4x+4+3} dx$$

$$\int \frac{1}{(x+2)^2 + (\sqrt{3})^2} dx.$$

$$\frac{1}{\sqrt{3}} \tan^{-1}\left(\frac{x+2}{\sqrt{3}}\right) + c.$$

(ii) Evaluate: $\int \frac{x+7}{x^2+4x+7}\,dx$

[4]

Question 10

A jewellery seller has precious gems in white and red colour which he has put in three boxes. The distribution of these gems is shown in the table given below:

Box	Number of Gems	
	White	Red
I	1	2
II	2	3
III	3	1

$$\frac{\frac{1}{3}\times\frac{{}^2C_1\times{}^3C_1}{{}^5C_2}}{\frac{1}{3}\times\frac{{}^1C_1\times{}^2C_1}{{}^3C_2}+\frac{1}{3}\times\frac{{}^2C_1\times{}^3C_1}{{}^5C_2}+\dots}$$

$=$

He wants to gift two gems to his mother. So, he asks her to select one box at random and pick out any two gems one after the other without replacement from the selected box. The mother selects one white and one red gem.

Calculate the probability that the gems drawn are from Box II.

[6]

Question 11

A furniture factory uses three types of wood namely, teakwood, rosewood and satinwood for manufacturing three types of furniture, that are, table, chair and cot.
The wood requirements (in tonnes) for each type of furniture are given below:

	Table x	Chair y	Cot z
Teakwood	2	3	4
Rosewood	1	1	2
Satinwood	3	2	1

$2x+3y+4z$
$x+y+2z$
$3x+2y+z$

It is found that 29 tonnes of teakwood, 13 tonnes of rosewood and 16 tonnes of satinwood are available to make all three types of furniture.
Using the above information, answer the following questions:

(i) Express the data given in the table above in the form of a set of simultaneous equations.

(ii) Solve the set of simultaneous equations formed in subpart (i) by matrix method.

(iii) Hence, find the number of table(s), chair(s) and cot(s) produced.

$$\begin{bmatrix} 2 & 3 & \\ 1 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix}$$

$x = 2$
$y = 3$
$z = 4.$

Question 12 [6]

(i) Mrs. Roy designs a window in her son's study room so that the room gets maximum sunlight. She designs the window in the shape of a rectangle surmounted by an equilateral triangle. If the perimeter of the window is 12 m, find the dimensions of the window that will admit maximum sunlight into the room.

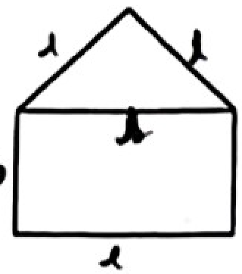
$A = lb + \frac{\sqrt{3}\, l^2}{4}$

$P = 3l + 2b$

$12 = 3l + 2b$

$\boxed{\frac{12-3l}{2} = b}$

$A = \frac{l(12-3l)}{2} - \frac{\sqrt{3}\, l^2}{4}$



$\frac{dA}{dl} = \frac{1}{2}(12-6l) - \frac{2\sqrt{3}\, l}{4}$

$\frac{d^2A}{dl^2} = -\frac{6}{2} - \frac{\sqrt{3}}{2}$ maximum val

$\frac{1}{2}(12-6l) = \frac{\sqrt{3}\, l}{2}$

OR

(ii) Sumit has bought a closed cylindrical dustbin. The radius of the dustbin is $'r'\,cm$ and height is $'h'\,cm$. It has a volume of $20\pi\ cm^3$.

$12 = l(\sqrt{3}+6)$

$l = \frac{12}{\sqrt{3}+6}$

put this value in A.

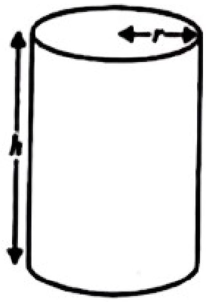
$V = \pi r^2 h$

$20\pi = \pi r^2 h$

$h = \frac{20}{r^2}$

T.S.A $= 2\pi r h + 2\pi r^2$

$= 2\pi r \cdot \frac{20}{r^2} + 2\pi r^2$



(a) Express $'h'$ in terms of $'r'$, using the given volume.

(b) Prove that the total surface area of the dustbin is $2\pi r^2 + \frac{40\pi}{r}$

$= \frac{40\pi}{r} + 2\pi r^2$

(c) Sumit wants to paint the dustbin. The cost of painting the base and top of the dustbin is ₹ 2 per cm^2 and the cost of painting the curved side is ₹ 25 per cm^2. Find the total cost in terms of $'r'$, for painting the outer surface of the dustbin including the base and top.

(d) Calculate the minimum cost for painting the dustbin.

Cost $= \frac{40\pi}{r} \times 25 + 2\pi r^2 \times 2$

(c) Cost $= \frac{1000\pi}{r} + 4\pi r^2$

29
13
16

Question 13 [6]

(i) Solve the following differential equation:

$2ye^{\frac{x}{y}}\,dx + \left(y - 2xe^{\frac{x}{y}}\right)dy = 0$, given $x = 0$ and $y = 1$

diff.

$\frac{dC}{dr} = \frac{-1000\pi}{r^2} + 8\pi r$

$\frac{1000\pi}{r^2} = 8\pi r$

$r^3 = 125$

OR

$dy = \frac{\quad}{x(x^2-1)}$

(ii) Solve the following differential equation:

$$x(x^2-1)\frac{dy}{dx} = 1, y = 0, \text{given } x = 2$$

$\frac{1}{x(x+1)(x-1)} = \frac{A}{x} + \frac{B}{x+1} + \frac{C}{x-1}$

$A = -1,\ B = 1/2,\ C$ ...

Now integrate then put the value [6]

Question 14

A primary school teacher wants to teach the concept of 'larger number' to the students of Class II.

To teach this concept, he conducts an activity in his class. He asks the children to select two numbers from a set of numbers given as 2, 3, 4, 5 one after the other without replacement.

All the outcomes of this activity are tabulated in the form of ordered pairs given below:

	2	3	4	5
2	(2,2)	(2,3)	(2,4)	(2,5)
3	(3,2)	(3,3)	(3,4)	(3,5)
4	(4,2)	(4,3)	(4,4)	(4,5)
5	(5,2)	(5,3)	(5,4)	(5,5)

(i) Complete the table given above.

(ii) Find the total number of ordered pairs having one larger number. 12

(iii) Let the random variable X denote the larger of two numbers in the ordered pair. Now, complete the probability [illegible] for X given below.

5) (2,5),(3,5),(4,5),(5,2),(5,3),(5,4)

X	[illegible]	[illegible]	5
$P(X = x)$	2/12	4/12	6/12

(iv) Find the value of $P(X < 5)$ $\frac{2}{12} + \frac{4}{12} = \frac{6}{12} = \frac{1}{2} = 0.5$

(v) Calculate the expected value of the probability distribution.

$A = \{a, b\}$ $\quad I = \{(a,a), (b,b)\}$

$R = \{(a,a), (b,b), (a,b)\}$

(iii) Let A be a non-empty set.

Statement 1: Identity relation on A is Reflexive.
Statement 2: Every Reflexive relation on A is an Identity relation.

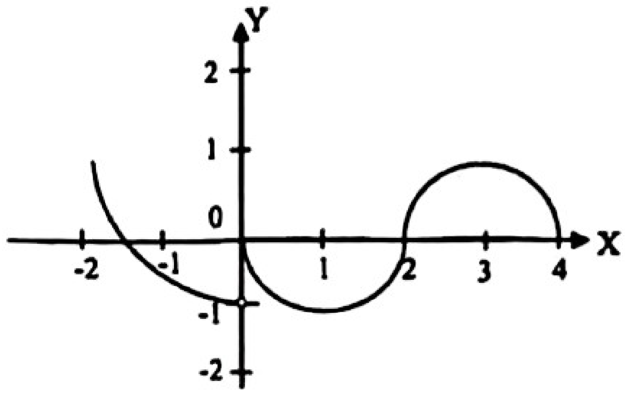
(a) Both the statements are true.

(b) Both the statements are false.

(c) Statement 1 is true and Statement 2 is false.

(d) Statement 1 is false and Statement 2 is true.

(iv) The graph of the function f is shown below.



Of the following options, at what values of x is the function f NOT differentiable?

(a) At $x = 0$ and $x = 2$

(b) At $x = 1$ and $x = 3$

(c) At $x = -1$ and $x = 1$

(d) At $x = -1{\cdot}5$ and $x = 1{\cdot}5$

(v) The value of $\operatorname{cosec}\left(\sin^{-1}\left(\frac{-1}{2}\right)\right) - \sec\left(\cos^{-1}\left(\frac{-1}{2}\right)\right)$ is equal to:

(a) -4

(b) 0

(c) -1

(d) 4

$\operatorname{cosec}(\operatorname{cosec}^{-1}(-2)) - \sec(\sec^{-1}(-2))$

$= -2 - (-2)$

$= -2 + 2$

$= 0$