MATHEMATICS

70. If Q denotes the set of all rational numbers and $f\left(\frac{p}{q}\right)=\sqrt{p^2-q^2}$ for any $\frac{p}{q}\in Q$, then observe the following statements

(A) $f\left(\frac{p}{q}\right)$ is real for each $\frac{p}{q}\in Q$ (B) $f\left(\frac{p}{q}\right)$ is complex number for each $\frac{p}{q}\in Q$

(a) Both A and B are false (b) A is false, B is true
(c) A is true, B is false (d) Both A and B are true

71. If $a^x = b^y = c^z = d^w$ then the value of $x\left(\frac{1}{y}+\frac{1}{z}+\frac{1}{w}\right)$ is

(a) $\log_a bcd$ (b) $\log_a abc$ (c) $\log_b cda$ (d) $\log_c dab$

72. The number of natural numbers less than 1000, in which no two digits are repeated is
(a) 792 (b) 837 (c) 738 (d) 720

73. The difference between two roots of the equation $x^3-13x^2+15x+189=0$ is 2, then the roots of the equation are

(a) – 3, - 7, - 9 (b) 3, -5, 7 (c) -4, -7, 9 (d) -3, 7, 9

74. The equation of the locus of z such that $\left|\frac{z-i}{z+i}\right|=2$, where $z=x+iy$ is a complex number of

(a) $3x^2-3y^2-10y+3=0$ (b) $3x^2+3y^2-10y+9=0$
(c) $3x^2-3y^2+10y-3=0$ (d) $3x^2+3y^2+10y+3=0$

75. In a triangle ABC, $\frac{s-a}{\Delta}=\frac{1}{8}$, $\frac{s-b}{\Delta}=\frac{1}{12}$, $\frac{s-c}{\Delta}=\frac{1}{24}$, then b =

(a) 20 (b) 16 (c) 15 (d) 30

76. The function $f(x)=\int_0^x \log_e\left(\frac{1-x}{1+x}\right)dx$

(a) an even function (b) a periodic function
(c) an odd function (d) neither even nor odd

77. If $\bar{i}-\bar{j}+\bar{k}$, $2\bar{i}+\bar{j}-2\bar{k}$, $3\bar{i}+\bar{j}+2\bar{k}$ are positive vectors of 3 points in space, then the vector area of the triangle formed by them is

(a) $4\bar{i}+\frac{7}{2}\bar{j}+\bar{k}$ (b) $4\bar{i}-\frac{7}{2}\bar{j}+\bar{k}$ (c) $3\bar{i}+\frac{2}{7}\bar{k}$ (d) $4\bar{i}-\frac{7}{2}\bar{j}-\bar{k}$

78. If $x = \tan 15°$, $y = \operatorname{cosec} 75°$ and $z = 4\sin 18°$ then

(a) z > y > x (b) x > y > z (c) y > z > x (d) z > x > y

79.90. $\underset{x \to \frac{\pi}{2}}{Lt} \dfrac{\cos x}{x - \frac{\pi}{2}}$

(a) -1 (b) 1 (c) $\frac{\pi}{2}$ (d) $-\frac{\pi}{2}$

80. The maximum value of $x^4 + x^2 + 1$ is

(a) $\frac{4}{3}$ (b) not existing (c) 0 (d) 1

81. One of the two events A and B occur. If $mP(A) = nP(B)$ then the odds in favour of B are

(a) $(m+n):n$ (b) n : m (c) m : n (d) $m:(n+m)$

82. If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u =$

(a) $\dfrac{-8}{(x+y+z)^2}$ (b) $\dfrac{9}{(x+y+z)^2}$ (c) $\dfrac{8}{(x+y+z)^2}$ (d) $\dfrac{-9}{(x+y+z)^2}$

83. If $\int \dfrac{\sin x}{\sin(x-\alpha)} dx = Ax + b \log \sin(x-\alpha) + c$, then (A, B) =

(a) $(-\cos\alpha, \sin\alpha)$ (b) $(-\sin\alpha, \cos\alpha)$ (c) $(\cos\alpha, \sin\alpha)$ (d) None

84. The image of the point (3, 4) with respect to the line $3x + 4y + 5 = 0$ is

(a) $\left(\frac{21}{5}, \frac{28}{5}\right)$ (b) $\left(\frac{-21}{5}, \frac{-28}{5}\right)$ (c) $\left(\frac{22}{5}, \frac{23}{5}\right)$ (d) $\left(\frac{21}{5}, \frac{-28}{5}\right)$

85. The differential equation obtained by eliminating the arbitrary constants a and b from $xy = ae^x + be^{-x}$ is

(a) $x\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - xy = 0$ (b) $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 3xy = 0$

(c) $x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - xy = 0$ (d) $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 3xy = 0$

86. The solution of $\frac{dy}{} = \frac{y^2}{}$

$dx \quad xy - x^2$ is

(a) $e^{y/x} = kx$ (b) $e^{y/x} = ky$ (c) $e^{-y/x} = kx$ (d) $e^{-y/x} = ky$

87.98. $\sqrt{12-\sqrt{68+48\sqrt{2}}}$

(a) $2-\sqrt{2}$ (b) $\sqrt{2}-\sqrt{3}$ (c) $2+\sqrt{2}$ (d) $\sqrt{2}+\sqrt{3}$

88. If $\dfrac{3x+2}{(x+1)(2x^2+3)} = \dfrac{A}{x+1} + \dfrac{Bx+C}{2x^2+3}$, then A + C – B =

(a) 0 (b) 1 (c) 2 (d) 3

89. $\operatorname{cosec}15° + \sec15° =$

(a) $2\sqrt{2}$ (b) $2\sqrt{6}$ (c) $3\sqrt{6}$ (d) $4\sqrt{6}$

90. Seven balls are drawn simultaneously from a bag containing 5 white and 6 green balls. The probability of drawing 3 white and 4 green balls is

(a) $\dfrac{7+{}^{6}c_1}{{}^{11}c_7}$ (b) $\dfrac{{}^{5}c_3+{}^{6}c_4}{{}^{11}c_7}$ (c) $\dfrac{{}^{5}c_2+{}^{6}c_2}{{}^{11}c_7}$ (d) None

91. If $f(x) = \begin{cases} \dfrac{1-\sqrt{2}\sin x}{x-4x} & if\ x \neq \dfrac{\pi}{4} \\ a & if\ x = \dfrac{\pi}{4} \end{cases}$ is continuous at $\dfrac{\pi}{4}$, then a =

(a) $\dfrac{1}{4}$ (b) $\dfrac{2}{4}$ (c) $\dfrac{3}{4}$ (d) None

92. If $\underset{x\to 0}{Lt}\left(\dfrac{\cos 4x + a\cos 2x + b}{x^4}\right)$ is finite, then the values of a, b are respectively

(a) 5, -4 (b) 4, 5 (c) -5, -4 (d) -4, 3

93. Dividing the interval, [0, 6] into 6 equal parts and by using trapezoidal rule the value of $\int_0^6 x^3\,dx$ approximately

(a) 333 (b) 331 (c) 332 (d) 334

94. 105. $\displaystyle\int_0^{\frac{\pi}{2}} \frac{dx}{1+\tan^3 x} =$

(a) π (b) $\dfrac{\pi}{2}$ (c) $\dfrac{\pi}{4}$ (d) $\dfrac{3\pi}{2}$

95. Which of the function from z to z (set of integers) is a bijection?

(a) $f(x) = x + 2$ (b) $f(x) = 3x + 1$ (c) $f(x) = x^3$ (d) none

96. The coefficient of x^5 in the expansion of $(1+x)^{21} + (1+x)^{22} + (1+x)^{23} + ... + (1+x)^{30}$ is

(a) 51_{C_5} (b) $31_{C_6} - 21_{C_6}$ (c) $31_{C_5} - 21_{C_5}$ (d) None

97. If $a = \cos\frac{4\pi}{3} + i\sin\frac{4\pi}{3}$, then $\begin{vmatrix} 1 & 1 & 1 \\ 1 & a & a^2 \\ 1 & a^2 & a \end{vmatrix}$ is

(a) purely real (b) purely imaginary (c) complex number (d) 0

98. The period of $\cos x.\sin\left(\frac{\pi}{4} - x\right)$ is

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{3}$ (c) π (d) $\frac{\pi}{4}$

99. If $\int(\sin 2x - \cos 2x)\,dx = \frac{1}{\sqrt{2}}\sin(2x - k) + c$, then k =

(a) $\frac{-5\pi}{3}$ (b) $\frac{5\pi}{4}$ (c) $\frac{5\pi}{3}$ (d) $\frac{-5\pi}{4}$

100. If $f(x+y) = f(x)\,f(y)\ \ \forall x, y$ and $f(x) \neq 0$, then $f^1(x)$ =

(a) $f^1(x)$ (b) $f^1(y)$ (c) $f(x)\,f(y)$ (d) $f(x)\,f^1(0)$

101. $\int \frac{2x+3}{x^2+x+1}\,dx$

(a) $\log|x^2+x+1| + \frac{2}{\sqrt{3}}\log\left(\frac{2x+1}{\sqrt{3}}\right) + c$ (b) $\log|x^2+x+1| + \frac{4}{\sqrt{3}}\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right) + c$

(c) $\log|x^2+x+1| + \frac{5}{\sqrt{3}}\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right) + c$ (d) $\log|x^2+x+1| + \frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right) + c$

102. The sum of the series $1 + \frac{1}{4\cdot 2!} + \frac{1}{16\cdot 4!} + \frac{1}{64\cdot 6!} + ...$ is

(a) $\frac{e+1}{2\sqrt{e}}$ (b) $\frac{e-1}{\sqrt{e}}$ (c) $\frac{e+1}{\sqrt{e}}$ (d) $\frac{e-1}{2\sqrt{e}}$

103. If (3, –2) is the mid point of the chord AB of circle $x^2 + y^2 - 4x + 6y - 5 = 0$ then AB =

(a) 16 (b) 8 (c) 4 (d) 12

104. The area bounded by the circle $x^2 + y^2 = a^2$ and the line x + y = a in the first quadrant is

(a) $(\pi - 2)a^2$ (b) $\frac{\pi a^2}{\ }$ (c) $\frac{1}{\ }(\pi - 2)a^2$ (d) $\left(\frac{\pi - 4}{\ }\right)a^2$

2 4 (2)

116. Two sides a triangle lie along $2x^2 - 5xy + 2y^2 = 0$ and the point (2, 3) is the centroid. The equation of the third side is

(a) 7x – 2y – 12 = 0 (b) 7x + 2y – 12 = 0 (c) 7x + 2y + 12 = 0 (d) None

117. The latus rectum of a parabola whose focal chord is PSQ such that SP = 3 and SQ = 2 is given by

(a) $\frac{12}{5}$ (b) $\frac{24}{5}$ (c) $\frac{16}{5}$ (d) $\frac{48}{5}$

118. The line $r\cos(\theta-\alpha)=p,\ r\sin(\theta-\alpha)=q$ are

(a) parallel to each other (b) inclined at an angle α to each other

(c) inclined at an angle 60^0 to each other (d) perpendicular to each other

119. The equation of the pair of straight lines perpendicular to the pair $2x^2+5xy+2y^2+10x+5y=0$ and passing through the origin is

(a) $2x^2+5xy+2y^2=0$ (b) $2x^2-3xy+y^2=0$

(c) $2x^2+3xy+y^2=0$ (d) $2x^2-5xy+2y^2=0$

120. The product of the distinct $(2n)^{th}$ roots of $1+i\sqrt{3}$ is equal to

(a) $\frac{1+i\sqrt{3}}{4}$ (b) $\frac{-1+i\sqrt{3}}{2}$ *(c)* $-1-i\sqrt{3}$ *(d)* $1+i\sqrt{3}$

121. The angles of a triangle are in the ratio 3 : 5 : 10. Then the ratio of the smallest side to the greatest side is

(a) $1:\sin 10^\circ$ (b) $1:2\cos 10^\circ$ (c) $1:\sin 20^\circ$ (d) $1:\cos 20^\circ$

122. The elevation of an object on a hill is observed from a certain point in the horizontal plane through its base, to be 30^0. After walking 120 m towards it on level ground the elevation is found to be 60^0. Then the height of the object (in meters) is

(a) 120 (b) 140 (c) $140\sqrt{3}$ (d) $60\sqrt{3}$

123.

$$\begin{vmatrix} \log e & \log e^2 & \log e^3 \\ \log e^2 & \log e^3 & \log e^4 \\ \log e^3 & \log e^4 & \log e^5 \end{vmatrix} =$$

(a) 0 (b) $2\log e$ (c) $3\log e$ (d) $4\log e$

124. The length of the tangent around to the circles $x^2+y^2-2x+4y-11=0$ from the point (1, 3) is

(a) 3 (b) -3 (c) 4 (d) -4

125. Vector equation of the plane passing through the point $\bar{i}+\bar{j}+\bar{k}$ parallel to the vectors

$2i+3\bar{j}+4k$, $\bar{i}-2\bar{j}+3k$

(a) $\bar{r}=\left(\bar{i}+\bar{j}+\bar{k}\right)+s\left(2\bar{i}+3\bar{j}+4\bar{k}\right)+t\left(\bar{i}-2\bar{j}+3\bar{k}\right)$

(b) $\bar{r}=\left(1-s\right)\left(\bar{i}+\bar{j}+\bar{k}\right)+s\left(2\bar{i}+3\bar{j}+4\bar{k}\right)+t\left(\bar{i}-2\bar{j}+3\bar{k}\right)$

(c) $\bar{r}=\left(1-s-t\right)\left(\bar{i}+\bar{j}+\bar{k}\right)+s\left(2\bar{i}+3\bar{j}+4\bar{k}\right)+t\left(\bar{i}-2\bar{j}+3\bar{k}\right)$ (d) none

126. If $\bar{a}, \bar{b}, \bar{c}$ are 3 vectors such that $\bar{a}\cdot(\bar{b}+\bar{c})=\bar{b}\cdot(\bar{c}+\bar{a})=\bar{c}\cdot(\bar{a}+\bar{b})=0$ and $|\bar{a}|=1, |\bar{b}|=4, |\bar{c}|=8$ then $|\bar{a}+\bar{b}+\bar{c}|=$

(a) 9 (b) 18 (c) 13 (d) 26

127. $\sin\frac{\pi}{5}\cdot\sin\frac{2\pi}{5}\cdot\sin\frac{3\pi}{5}\cdot\sin\frac{4\pi}{5}=$

(a) $\frac{2}{16}$ (b) $\frac{}{16}$ (c) $\frac{}{16}$ (d) $\frac{}{16}$

128. The number of solutions of $\tan x+\sec x=2\cos x$ in $[0, 2\pi]$

(a) 1 (b) 2 (c) 4 (d) 3

129. $\underset{x\to\infty}{Lt}\sqrt{x+\sqrt{x+\sqrt{x}}-\sqrt{x}}$

(a) 0 (b) log 2 (c) $\frac{1}{2}$ (d) log 4

130. The relative error in the area of the circle is k times the relative error in the radius then k

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) 2 (d) 3

131. Area bounded between the curves $x^2=4y, y^2=4x$ is

(a) $\frac{16}{3}$ sq. units (b) $\frac{64}{3}$ sq. units (c) $\frac{1}{3}$ sq. units (d) $\frac{4}{3}$ sq. units

132. The radical centre of the circles $x^2+y^2=1$, $x^2+y^2-2x=1$ and $x^2+y^2-2y=1$ is

(a) (1, 1) (b) (2, 2) (c) (0, 0) (d) (3, 3)

133. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{}}\sin\left(\log\left(x+\sqrt{x^2+1}\right)\right)dx=$

(a) 0 (b) π (c) $-\pi$ (d) 1

134. If $f: R\to R$ is defined by $f(x)=\frac{1}{\quad}$ $2\cos 3x$

for each $x \in R$, then the range of f is

(a) $\left(\frac{1}{3}, 1\right)$ (b) $\left[\frac{1}{3}, 1\right)$ (c) $\left[\frac{1}{3}, 1\right]$ (d) $\left(\frac{1}{3}, 1\right]$

135. The coefficient of x^k in the expansion of $\frac{1-2x-x^2}{e^{-x}}$ is

(a) $\frac{1-k-k^2}{k!}$ (b) $\frac{k+k^2-1}{k!}$ (c) $\frac{1+k-k^2}{k!}$ (d) none

136. The domain of the function $f(x)=\sqrt[3]{\dfrac{2x-1}{x^2-10x-11}}$

(a) $(-\infty,-1)\cup(-1,11)\cup(11,\infty)$ (b) (-1,11)

(c) $(-\infty,-1)\cup(11,\infty)$ (d) $(-\infty,\infty)$

137. A cubical die is loaded so that the probability of face k is proportional to k, k = 1, 2, 3, 4, 5, 6. it is rolled. Find the probability of getting an odd integer face

(a) $\frac{1}{7}$ (b) $\frac{3}{7}$ (c) $\frac{4}{7}$ (d) $\frac{5}{7}$

138. If $f(x)=\begin{cases} 8^x-4^x-2^x+1, & for\ x>0 \\ e^x\sin x+p\sin x+a\log 4, & for\ x\le 0 \end{cases}$ is continuous at x = 0 then a =

(a) 2 (b) $\log_e 3$ (c) $\log_e 5$ (d) $\log_e 2$

139. $\sum \bar{i}\times(\bar{a}\times\bar{i}) =$

(a) $3\bar{a}$ (b) $2\bar{a}$ (c) $4\bar{a}$ (d) $5\bar{a}$

140. If $x=2+2^{1/3}+2^{2/3}$ then $x^3-6x^2+6x+3 =$

(a) 1 (b) 3 (c) 4 (d) 5

141. If $\sin x+\sin y=3(\cos y-\cos x)$ then $\dfrac{\sin 3x}{\sin 3y}=$

(a) 5 (b) 4 (c) -1 (d) 1

142. The number of lines that can be drawn through the point (4, -5) at a distance of 5 units from the point (1, 3) is

(a) 2 (b) 0 (c) 3 (d) 5

143. If the polar of p(-1, 2) with respect to $(x-3)^2+(y-4)^2=16$ meets the circle at Q and R then the circum centre of the triangle PQR is

(a) (1, -3) (b) (1, 3) (c) (-1, 3) (d) (-1, -3)

144. The foci of the ellipse $\dfrac{x^2}{16}+\dfrac{y^2}{b^2}=1$ and the Hyperbola $\dfrac{x^2}{144}-\dfrac{y^2}{81}=\dfrac{1}{25}$ coincide then b^2 =

(a) 5 (b) 9 (c) 11 (d) 7

145. The probability of a bomb hitting a bridge is $\frac{1}{2}$ and one hit is sufficient to destroy it. The

least number of bombs required so that the probability of the bridge being destroyed is greater than 0.8 is

(a) 2 (b) 3 (c) 4 (d) 5

146. A coin is tossed ‘n’ terms. The probability of getting head at least once is greater than 0.8 then the least value of such ‘n’ is

(a) 3 (b) 4 (c) 5 (d) 6

147. The period of $\frac{\cot(5x+3)+\sin(3x+4)}{\sec(3-4x)-\cos(4-6x)}$ is

(a) 4π (b) 3π (c) 2π (d) $-\pi$

148. The principal value of $\cos^{-1}\left[\frac{1}{\sqrt{2}}\left(\cos\frac{9\pi}{10}-\sin\frac{9\pi}{10}\right)\right]$ is

(a) $\frac{3\pi}{20}$ (b) $\frac{17\pi}{20}$ (c) $\frac{7\pi}{20}$ (d) $\frac{9\pi}{20}$

149. The equation of the circle passing through (3,-4) and concentric with $x^2+y^2+4x-2y+1=0$ is $x^2+y^2+2gx+2fy+c=0$ then $12g-22f+c=$

(a) 0 (b) 2 (c) 3 (d) 1

150. $\underset{n\to\infty}{Lt}\frac{[x]+[2n]+---+[nx]}{n^2}$ is

(a) n (b) 2n (c) $\frac{n}{2}$ (d) $\frac{n}{3}$

151. If errors of 2% each are made in the base radius and height of cone, then percentage error in its volume is

(a) 4 (b) 5 (c) 6 (d) 8

152. The value of $(127)^{1/3}$ to 4 decimal places is

(a) 5.4267 (b) 5.0267 (c) 5.5267 (d) 5.0001

153. $y=\tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)$ then $\frac{dy}{dx}$ is

(a) $\frac{1}{\sqrt{1-x^2}}$ (b) $\frac{1}{4\sqrt{1-x^2}}$ (c) $\frac{1}{2\sqrt{1-x^2}}$ (d) none

154. If $\cot\frac{A}{2}:\cot\frac{B}{2}:\cot\frac{C}{2}=3:5:7$ then a : b : c

(a) 6 : 5 : 4 (b) 6 : 7 : 8 (c) 6 : 4 : 3 (d) none

155. If the rate of decrease of $\frac{x^2}{2}-2x+5$ is twice the decrease of x then x

(a) 1 (b) 2 (c) 3 (d) 4

156. If $\log_{10}\left(98+\sqrt{x^2-12x+36}\right)=2$ then x =

— —

(a) 6 (b) 7 (c) 8 (d) 9

157. Volume of the tetrahedron with edges $\bar{i}+2\bar{j}+2\bar{k}, 2\bar{i}-\bar{j}+2\bar{k}, 2\bar{i}+2\bar{j}-\bar{k}$

(a) $\frac{13}{2}$ cubic unit (b) $\frac{15}{2}$ cubic unit (c) $\frac{7}{2}$ cubic unit (d) $\frac{9}{2}$ cubic unit

158. If $\int \frac{2^x}{\sqrt{1-4^x}}\,dx = k\sin^{-1}\left(2^x\right)+c$ then k =

(a) $\frac{1}{\log 2}$ (b) $\frac{1}{2}\log 2$ (c) $\frac{1}{2\log 2}$ (d) none

159. One of the limiting point of the coaxial system of the circles determined by the two touching circles $\left(x-2\right)^2+\left(y+3\right)^2=5$ and $\left(x-5\right)^2+\left(y-3\right)^2=20$ is

(a) (2, -3) (b) (3, -1) (c) (-3, -3) (d) (-2, -3)

160. If $\operatorname{cosec}A+\cot A=\frac{11}{2}$ then $\tan A$ is

(a) $\frac{21}{22}$ (b) $\frac{15}{22}$ (c) $\frac{11}{7}$ (d) $\frac{117}{43}$

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