MATHEMATICS

61. If $e^x + e^{f(x)} = e$, then for $f(x)$

(a) $D_f = (-\infty, 0], R_f = (-\infty, 0]$
(b) $D_f = (-\infty, 1), R_f = (-\infty, 1)$
(c) $D_f = (-\infty, 0), R_f = (-\infty, 1)$
(d) $D_f = (-\infty, 1], R_f = (-\infty, 1]$

62. If $f(x) = ax^2 + bx + c$ and roots of $f(x) = 0$, represents the slope of two different line. If one of the line is $x + 1 = 0$, then equation of other line passing through origin is.

(a) $y = (a - b + c)x$ (b) $bx + cy = 0$ (c) $cx + by = 0$ (d) None of these

63. If three vectors $\vec{a}, \vec{b}, \vec{c}$ are such that $\vec{a} \neq \vec{0}$ and $\vec{a}\times\vec{b} = 2\vec{a}\times\vec{c}, |\vec{a}| = |\vec{c}| = 1, \ |\vec{b}| = 4$ and the angle between $\vec{b}$ and $\vec{c}$ is $\cos^{-1}\frac{1}{4}$ then $\vec{b} - 2\vec{c} = \lambda\vec{a}$ where λ is equal to

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

64. If $I = \int_0^{\pi/2} \ell n(\sin x)\, dx$ then $\int_{-\pi/4}^{\pi/4} \ell n(\sin x + \cos x)\, dx =$

(a) $\frac{I}{2}$ (b) $\frac{I}{4}$ (c) $\frac{I}{\sqrt{2}}$ (d) I

65. Let z_1, z_2, z_3 be three distinct complex numbers satisfying $|z_1 - 1| = |z_2 - 1| = |z_3 - 1|$. If $z_1 + z_2 + z_3 = 3$ then z_1, z_2, z_3 must represent the vertices of :

(a) an equilateral triangle
(b) an isosceles triangle which is not equilateral
(c) a right triangle
(d) nothing definite can be said

66. If $f(x) = \begin{cases} \sin x, \ x \neq n\pi, \\ 2 \text{ otherwise} \end{cases}$ n is an integer $g(x) = \begin{cases} x^2 + 1 & x \neq 0, 2 \\ 4, & x = 0 \\ 5, & x - 2 \end{cases}$, then $\lim_{x\to 0} g(f(x))$ is

(a) 1 (b) 5 (c) 6 (d) 7.

67. In a class tournament where the participants were to play one game with another, two class players fell ill, having played 3 games each. If the total number of games played is 84, the number of participants at the beginning was :

(a) 15 (b) 16 (c) 20 (d) 21

68. The ratio in which the plane $\vec{r}.(\vec{i} - 2\vec{j} + 3\vec{k}) = 17$ divides the line joining the points $-2\vec{i} + 4\vec{j} + 7\vec{k}$ and $3\vec{i} - 5\vec{j} + 8\vec{k}$ is

(a) 1 : 5 (b) 1 : 10 (c) 3 : 5 (d) 3 : 10

69. The equation to the circle which has a tangent $2x - y - 1 = 0$ at (3, 5) on it and with the centre on $x + y = 5$, is

(a) $x^2 + y^2 + 6x - 16y + 28 = 0$
(b) $x^2 + y^2 - 6x + 16y - 28 = 0$
(c) $x^2 + y^2 + 6x + 6y - 28 = 0$
(d) $x^2 + y^2 - 6x - 6y - 28 = 0$

70. Let $f(x) = [x] + |1 - x|$ for $-1 < x < 3$ ([,] denotes the greatest integer function). The point(s), if any where this function is not differentiable, is :

(a) {0, 1} (b) {-1, 0} (c) {-2} (d) {3}

71. The vector equation of the plane through the point (2, 1, -1) and passing through the line of intersection of the plane $\vec{r}.(\hat{i}+3\hat{j}-\hat{k})=0$ and $\vec{r}.(\hat{j}+2\hat{k})=0$ is

(a) $\vec{r}.(\hat{i}+9\hat{j}+11\hat{k})=0$ (b) $\vec{r}.(\hat{i}+9\hat{j}+11\hat{k})=6$

(c) $\vec{r}.(\hat{i}-3\hat{j}-13\hat{k})=0$ (d) None

72. Solution of the equation $\cos^2 x\frac{dy}{dx}-(\tan 2x)y=\cos^4 x, |x|<\frac{\pi}{4},$ when $y\left(\frac{\pi}{6}\right)=\frac{3\sqrt{3}}{8}$ is

(a) $y = \tan 2x \cos^2 x$ (b) $y = \cot 2x. \cos^2 x$ (c) $y = \frac{1}{2}\tan 2x \cos^2 x$ (d) $y=\frac{1}{2}\cot 2x.\cos^2 x$

73. A tangent and a normal is drawn at the point $P \equiv (16, 16)$ of the parabola $y^2 = 16x$ which cut the axis of the parabola at the points A and B respectively. If the centre of the circle through P, A and B is C then the angle between PC and the axis of x is

(a) $\tan^{-1}\frac{1}{2}$ (b) $\tan^{-1}2$ (c) $\tan^{-1}\frac{3}{4}$ (d) $\tan^{-1}\frac{4}{3}$

74. If the equations $x^3 + 5x^2 + px + q = 0$ and $x^3 + 7x^2 + px + r = 0$ have two roots in common, the product of non common roots of two equations is

(a) 35 (b) -35 (c) 35 + p - q (d) 35 + p + q - r

75. Let $f(x)=\int_0^x(\sin t-\cos t)(e^t-2)(t-1)^3(t-2)^5\,dt\ (0<x\le 4)$. Then number of points, where f(x) assumes local maximum value, is

(a) one (b) two (c) three (d) None of these

76. One hundred identical coins, each with probability, p, of showing up heads are tossed once. If $0 < p < 1$ and the probability of head showing on 50 coins is equal to that of heads showing on 51 coins, then the values of p is

(a) $\frac{1}{2}$ (b) $\frac{49}{101}$ (c) $\frac{50}{101}$ (d) $\frac{51}{101}$

77. The value of the definite integral $\int_0^1 dx/(x^2+2x\cos\alpha+1)$ for $0<\alpha<\pi$, is equal to

(a) $\sin\alpha$ (b) $\tan^{-1}(\sin\alpha)$ (c) $\alpha\sin\alpha$ (d) $(\alpha/2)(\sin\alpha)^{-1}$

78. The slope of the tangent to a curve $y = f(x)$ at $(x, f(x))$ is $2x + 1$. If the curve passes through the point (1, 2), then the area of the region bounded by the curve, the x-axis and the line $x = 1$ is

(a) 5/6 (b) 6/5 (c) 1/6 (d) 6

79. If f(x) = x (x-2) (x-4) , $1 \leq x \leq 4$, then a number satisfying the conditions of the mean value theorem is

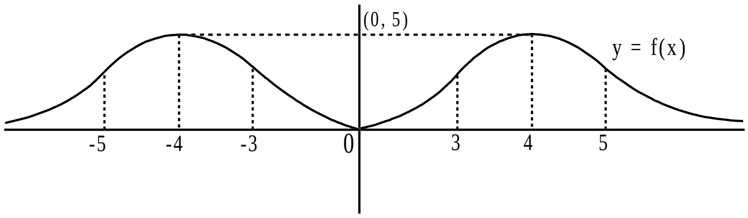
(a) 1 (b) 2 (c) 5/2 (d) 7/2

80. If a function f(x) is defined as f(x) = min{1 - $\tan^n$x, 1 - $\sin^n$x, 1- x^n}. Then the left derivative of the function at $x = \frac{\pi}{4}$ is;

(a) - 2n (b) - 2(n + 1) (c) $-n\left(\frac{\pi}{4}\right)^{n-1}$ (d) None of these

Directions for questions 81 to 85.

If any function of y = f(x) is defined as $f: R \rightarrow [0, 5]$ (See the graph)



81. Which is the wrong statement

(a) f(x) is having two maxima & one min (b) f(x) is an even function

(c) curve y = f(x) is having asymptotes (d) all above are wrong

82. f(x) = $(x - 4)^2$ having

(a) 1 real root (b) 2 real roots (c) 3 real roots (d) no real roots

83. y = $f^{-1}(x)$ can be define for

(a) $x \in R$ (b) $x \in (0, 4)$ (c) $x \in (-4, 4)$ (d) $x \in \phi$

84. No. of points of inflection of y = f(x)

(a) 0 (b) 1 (c) 2 (d) 4

85. $\sin^{-1}\left(\frac{f(x)}{5}\right)$ is define for

(a) $x \in R$ (b) $x \in \phi$ (c) only for $x \in [-3, 3]$ (d) only for $x \in [-5, 5]$

Directions for questions 86 to 90.

Mr. "A" & "B" solved the following question asked in a question paper

$$\lim_{x \to \frac{\pi}{2}} \frac{2^{\cot x} - 2^{\cos x}}{\cot x - \cos x}$$

Mr. "A" solved question in following way

$$\lim_{x \to \frac{\pi}{2}} \frac{2^{\cot x} - 1 + 1 - 2^{\cos x}}{\cot x - \cos x} \quad \text{................ (step - 1)}$$

$$\lim_{x \to \frac{\pi}{2}} \frac{\frac{2^{\cot x} - 1}{\cot x}\cot x - \frac{2^{\cos x} - 1}{\cos x}\cos x}{\cot x - \cos ec x} \quad \text{............... (step - 2)}$$

$$\lim_{x\to\frac{\pi}{2}} \frac{\cot x(\ln 2)-\cos x(\ln 2)}{\cot x-\cos x} \qquad \text{.............. (step - 3)}$$

$$\lim_{x\to\frac{\pi}{2}} \ln 2\left(\frac{\cot x-\cos x}{\cot x-\cos x}\right) = \ln 2 \text{ Ans} \qquad \text{.............. (step - 4)}$$

Mr. "B" solved question in following

$$\lim_{x\to\frac{\pi}{2}} \frac{2^{\cos x}\left(2^{\cot x-\cos x}-1\right)}{\cot x-\cos x} \qquad \text{................. (step - 1)}$$

$$= 2^0 \ln 2 \qquad \text{................. (step - 2)}$$

$$= \ln 2 \text{ Ans} \qquad \text{................. (step - 3)}$$

86. Which is correct statement

(a) Mr. **A** gave correct solution but, Mr. B gave wrong solution

(b) Mr. **A** gave wrong solution but, Mr. B gave correct solution

(c) Mr. **A** & B both gave correct solution.

(d) Both gave wrong solution

87. Which is correct statement

(a) Mr. "**A**" did mistake in (step - 2) (b) Mr. "**A**" did mistake in (step - 3)

(c) Mr. "**A**" did mistake in (step - 4) (d) No mistake in solution given by Mr. "**A**".

88. Which is correct statement

(a) Mr. "B" did mistake in (step - 1) (b) Mr. "B" did mistake in (step - 2)

(c) Mr. "B" did mistake in (step - 3) (d) No mistake in solution given by Mr. "B".

89. Mr. "**A**" did mistake because

(a) In (step - 2) he multiply by cot x & cos x in N^r & D^r which is zero.

(b) In (step - 3) he solved the limit partially

(c) In (step - 4) he cancelled the term (cot x - cos x) which is zero for $x = \frac{\pi}{2}$

(d) No mistake in any step.

90. Mr. "B" did mistake because

(a) he took $2^{\cos x}$ common in (step - 1)

(b) he considered that $\lim_{x\to\frac{\pi}{2}} \frac{2^{\cot x-\cos x}-1}{\cot x-\cos x}$ is same as $\lim_{x\to 0} \frac{2^x-1}{x}$

(c) In step - 3 he kept $2^{\cos x}$ as 2^0

(d) no mistake in solution given by Mr. B.

IITian Test Series

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Student's Name :

Q.No	A	B	C	D
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5.	O	O	O	O
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83.	O	O	O	O
84.	O	O	O	O
85.	O	O	O	O
86.	O	O	O	O
87.	O	O	O	O
88.	O	O	O	O
89.	O	O	O	O
90.	O	O	O	O

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