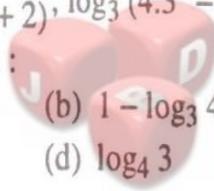


1. If $\alpha \neq \beta$ and $\alpha^2 = 5\alpha - 3$, $\beta^2 = 5\beta - 3$, then the equation having α/β and β/α as its roots is :
 (a) $3x^2 + 19x + 3 = 0$ (b) $3x^2 - 19x + 3 = 0$
 (c) $3x^2 - 19x - 3 = 0$ (d) $x^2 - 16x + 1 = 0$
2. If $y = (x + \sqrt{1+x^2})^n$, then $(1+x^2) \frac{d^2y}{dx^2} + x \frac{dy}{dx}$ is :
 (a) n^2y (b) $-n^2y$ (c) $-y$ (d) $2x^2y$
3. If $1, \log_3 \sqrt{(3^{1-x}+2)}, \log_3(4 \cdot 3^x - 1)$ are in A.P, then x equals :
 (a) $\log_3 4$ (b) $1 - \log_3 4$
 (c) $1 - \log_4 3$ (d) $\log_4 3$
4. A problem in mathematics is given to three students A, B, C and their respective probability of solving the problem is $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$. Probability that the problem is solved is :
 (a) $\frac{3}{4}$ (b) $\frac{1}{2}$
 (c) $\frac{2}{3}$ (d) $\frac{1}{3}$
5. The period of $\sin^2 \theta$ is :
 (a) π^2 (b) π
 (c) 2π (d) $\frac{\pi}{2}$
6. l, m, n are the p^{th}, q^{th} and r^{th} term of an G.P. and all positive, then $\begin{vmatrix} \log l & p & 1 \\ \log m & q & 1 \\ \log n & r & 1 \end{vmatrix}$ equals :
 (a) 3 (b) 2
 (c) 1 (d) zero
7. $\lim_{x \rightarrow 0} \frac{\sqrt{1 - \cos 2x}}{\sqrt{2} x}$ is :
 (a) λ (b) -1
 (c) zero (d) does not exist



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23. The domain of definition of the function

$$f(x) = \sqrt{\log_{10}\left(\frac{5x - x^2}{4}\right)}$$

- (a) [1, 4] (b) [1, 0]
(c) [0, 5] (d) [5, 0]

24. If $\sin y = a \sin(x + y)$, then $\frac{dy}{dx}$ is :

- (a) $\frac{\sin a}{\sin^2(a+y)}$ (b) $\frac{\sin^2(a+y)}{\sin a}$
(c) $\sin a \sin^2(a+y)$ (d) $\frac{\sin^2(a-y)}{\sin a}$

25. If $x^y = e^{x-y}$ then $\frac{dy}{dx}$ is :

- (a) $\frac{1+x}{1+\log x}$ (b) $\frac{1-\log x}{1+\log x}$
(c) not defined (d) $\frac{\log x}{(1+\log x)^2}$

26. The two curves $x^3 - 3xy^2 + 2 = 0$ and $3x^2y - y^3 - 2 = 0$:

- (a) cut at right angles
(b) touch each other
(c) cut at an angle $\frac{\pi}{3}$
(d) cut at an angle $\frac{\pi}{4}$

27. The function $f(x) = \cot^{-1} x + x$ increases in the interval :

- (a) $(1, \infty)$
(b) $(-1, \infty)$
(c) $(-\infty, \infty)$
(d) $(0, \infty)$

28. The greatest value of $f(x) = (x+1)^{1/3} - (x-1)^{1/3}$ on $[0, 1]$ is :

- (a) 1 (b) 2
(c) 3 (d) $1/3$

29. Evaluate $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$:

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

30. $\int \frac{dx}{x(x^n + 1)}$ is equal to :

- (a) $\frac{1}{n} \log\left(\frac{x^n}{x^n + 1}\right) + c$
(b) $\frac{1}{n} \log\left(\frac{x^n + 1}{x^n}\right) + c$
(c) $\log\left(\frac{x^n}{x^n + 1}\right) + c$
(d) none of these

31. The area bounded by the curve $y = 2x - x^2$ and the straight line $y = -x$ is given by :

- (a) $\frac{9}{2}$ (b) $\frac{43}{6}$
(c) $\frac{35}{6}$ (d) none of these

32. The differential equation of all non-vertical lines in a plane is :

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

33. Given two vectors $\hat{i} - \hat{j}$ and $\hat{i} + 2\hat{j}$ the unit vector coplanar with the two vectors and perpendicular to first is :

- (a) $\frac{1}{\sqrt{2}}(\hat{i} + \hat{j})$ (b) $\frac{1}{\sqrt{5}}(2\hat{i} + \hat{j})$
(c) $\pm \frac{1}{\sqrt{2}}(\hat{i} + \hat{k})$ (d) none of these

34. The vector $\hat{i} + x\hat{j} + 3\hat{k}$ is rotated through an angle θ and doubled in magnitude, then it becomes $4\hat{i} + (4x-2)\hat{i} + 2\hat{k}$. The value of x is :

- (a) $\left(-\frac{2}{3}, 2\right)$
(b) $\left(\frac{1}{3}, 2\right)$
(c) $\left(\frac{2}{3}, 0\right)$
(d) $(2, 7)$

35. A parallelopiped is formed by planes drawn through the points $(2, 3, 5)$ and $(5, 9, 7)$, parallel to the coordinate planes. The length of a diagonal of the parallelopiped is :
- 7
 - $\sqrt{38}$
 - $\sqrt{155}$
 - None of these
36. The equation of the plane containing the line $\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n}$ is $a(x-x_1) + b(y-y_1) + c(z-z_1) = 0$, where :
- $ax_1 + by_1 + cz_1 = 0$
 - $al + bm + cn = 0$
 - $\frac{a}{l} = \frac{b}{m} = \frac{c}{n}$
 - $lx_1 + my_1 + nz_1 = 0$
37. A and B play a game where each is asked to select a number from 1 to 25. If the two numbers match, both of them win a prize. The probability that they will not win a prize in a single trial is :
- $\frac{1}{25}$
 - $\frac{24}{25}$
 - $\frac{2}{25}$
 - None of these
38. If A and B are two mutually exclusive events, then
- $P(A) < P(\bar{B})$
 - $P(A) > P(\bar{B})$
 - $P(A) < P(B)$
 - None of these
39. The equation of the directrix of the parabola $y^2 + 4y + 4x + 2 = 0$ is :
- $x = -1$
 - $x = 1$
 - $x = -\frac{3}{2}$
 - $x = \frac{3}{2}$
40. Let T_n denote the number of triangles which can be formed using the vertices of a regular polygon of n sides. If $T_{n+1} - T_n = 21$ then n equals :
- 5
 - 7
 - 6
 - 4
41. In a triangle ABC , $2ca \sin \frac{A-B+C}{2}$ is equal to :
- $a^2 + b^2 - c^2$
 - $c^2 + a^2 - b^2$
 - $b^2 - c^2 - a^2$
 - $c^2 - a^2 - b^2$
42. For $x \in R$ $\lim_{x \rightarrow \infty} \left(\frac{x-3}{x+2} \right)^x$ is equal to :
- e
 - e^{-1}
 - e^{-5}
 - e^5
43. The incentre of the triangle with vertices $(1, \sqrt{3})$, $(0, 0)$ and $(2, 0)$ is :
- $\left(1, \frac{\sqrt{3}}{2} \right)$
 - $\left(\frac{2}{3}, \frac{1}{\sqrt{3}} \right)$
 - $\left(\frac{2}{3}, \frac{\sqrt{3}}{2} \right)$
 - $\left(1, \frac{1}{\sqrt{3}} \right)$
44. If the vectors \vec{a} , \vec{b} and \vec{c} from the sides BC , CA and AB respectively, of a triangle ABC , then : **TM**
- $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{b} = 0$
 - $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a} = 0$
 - $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a} = 0$
 - $\vec{a} \times \vec{a} + \vec{a} \times \vec{c} + \vec{c} \times \vec{a} = 0$
45. If ω is an imaginary cube root of unity then $(1 + \omega - \omega^2)^7$ equals :
- 128ω
 - -128ω
 - $128 \omega^2$
 - $-128 \omega^2$
46. If $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix} = x + iy$ then :
- $x = 3, y = 1$
 - $x = 1, y = 3$
 - $x = 0, y = 3$
 - $x = 0, y = 0$
47. $\sin^2 \theta = \frac{4xy}{(x+y)^2}$ is true if and only if :
- $x + y \neq 0$
 - $x = y, x \neq 0, y \neq 0$
 - $x = y$
 - $x \neq 0, y \neq 0$



59. The equation of the chord joining two points (x_1, y_1) and (x_2, y_2) on the rectangular hyperbola $xy = c^2$ is :

(a) $\frac{x}{x_1 + x_2} + \frac{y}{y_1 + y_2} = 1$

(b) $\frac{x}{x_1 - x_2} + \frac{y}{y_1 - y_2} = 1$

(c) $\frac{x}{y_1 + y_2} + \frac{y}{x_1 + x_2} = 1$

(d) $\frac{x}{y_1 - y_2} + \frac{y}{x_1 - x_2} = 1$

60. If the vectors $\vec{c}, \vec{a} = x\hat{i} + y\hat{j} + z\hat{k}$ and $\hat{b} = \hat{j}$ are such that \vec{a}, \vec{c} and \vec{b} form a right handed system then \vec{c} is :
- (a) $z\hat{j} - x\hat{k}$ (b) $\vec{0}$
 (c) $y\hat{j}$ (d) $-z\hat{i} + x\hat{k}$



Answer – Key

1. b	2. a	3. b	4. a	5. b	6. d	7. d	8. a	9. b	10. a
11. c	12. a	13. b	14. a	15. a	16. b	17. b	18. a	19. b	20. d
21. a	22. b	23. a	24. b	25. d	26. a	27. c	28. b	29. a	30. a
31. a	32. a	33. c	34. a	35. a	36. b	37. b	38. a	39. d	40. b
41. b	42. c	43. d	44. b	45. d	46. d	47. b	48. a	49. b	50. a
51. a	52. b	53. c	54. c	55. b	56. b	57. b	58. b	59. a	60. a