

1. The value of k for which the points (0,0), (2,0), (0,1) and (0,k) lies on a circle is :

- (1) 1,2 (2) -1,2 (3) 0,2 (4) 0, 1

2. The area of the triangle formed by the tangent and normal at $(1, \sqrt{2})$ to the circle $x^2+y^2 = y$ and positive x-axis will be :

- (1) $1 \sqrt{3}$ (2) $4\sqrt{3}$ (3) $\sqrt{3}$ (4) $2\sqrt{3}$

3. A straight line makes a triangle of area 5 units with the axis of coordinates and is perpendicular to the line $5x - y = 1$, the equation of the line is :

- (1) $x + 5y \pm 5 = 0$ (2) $x - 5y \pm 5 \sqrt{2} = 0$

- (3) $x + 5y \pm 5 \sqrt{2}$ (4) $5x + y \pm \sqrt{2} = 0$

4. If the points $(\lambda, 2)$, $(\lambda, 4)$, $(\lambda, \lambda + 1)$ and $(\lambda, \lambda + 1)$ and $(\lambda + 4, 16)$ are collinear then the value of λ will be :

- (1) -4 (2) -5 (3) 4 (4) 5

5. The imaginary part of $\tan^{-1}(5i/3)$ is :

- (1) $\log 4$ (2) $\log 2$ (3) ∞ (4) 0

6. If $x = a + \omega y = a\omega = b\omega$ and $z = a\omega^2 + b\omega$ (where ω and ω^2 are the imaginary cube roots of unity) then the value of xyz is :

- (1) $3ab$ (2) $a^3 + b^3$ (3) $a^3 + b^3 + 3ab$ (4) $a^3 - b^3$

7. $\left[\frac{\sqrt{3} + i}{2} \right]^6 \left[\frac{i - \sqrt{3}}{2} \right]^6$ is equal to :

- (1) -1 (2) 2 (3) -1 (4) 1

8. If A is a square matrix their $A + A^T$ will be :

- (1) unit matrix
 (2) symmetric matrix
 (3) skew symmetric matrix
 (4) invertible matrix

9. $\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$ is equal to :

- (1) $4x^2y^2z^2$ (2) $4xyz$ (3) $x^2y^2z^2$ (4) xyz

10. The value of $(\sqrt{2} + 1)^6 + (\sqrt{2} - 1)^6$ is :

- (1) -99 (2) 99 (3) -198 (4) 198

11. If $(1 + x)^n = C_0 + C_1x + C_2x^2 + \dots + C_nx^n$, then the value of $C_1 + 2C_2 + 3C_3 + \dots + nC_n$:

- (1) 2^{n-1} (2) $n \cdot 2^{n-1}$ (3) 2^n (4) 0

12. The number of way in which 5 boys and 5 girl can be arranged in line such that not two girls come together will be :

- (1) $6 \times 5!$ (2) $5! \times 4!$ (3) $5! \times 6!$ (6) $(5!)^2$

13. If ${}^nC_{r-1} = 36$, ${}^nC_r = 84$ and ${}^nC_{r+1} = 216$ then n is equal to :

- (1) 5 (2) 10 (3) 9 (4) 8

14. If the roots of the equation $a(b-c)x^2 + b(c-a)x + c(c-b)$ are equal then a, b, c will be :

- (1) in H.P. (2) in G.P. (3) in A.P. (4) none of these

15. If the 5th and 11th term of H.P. are $\frac{1}{45}$ and $\frac{1}{69}$ respectively then its 16th terms is:

- (1) $\frac{1}{77}$ (2) $\frac{1}{81}$ (3) $\frac{1}{85}$ (4) $\frac{1}{89}$

16. The sum of the numbers which are divisible by 3 and lies between 250 to 1000 is equal to :

- (1) 156375 (2) 161575 (3) 136577 (4) 135657

17. If the equations $x^2 + 9x + q = 0$ and $x^2 + p'x + q' = 0$ ($p \neq p'$, $q \neq q'$) have one common root then the value of the root will be :

(1) $\frac{q - q'}{p - p'}$ or $\frac{pq - p'q'}{q - q'}$

(2) $\frac{q - q'}{p'p}$ or $\frac{pq' - p'q}{q - q'}$

(3) $\frac{pq' - p'q}{q - q'}$

(4) $\frac{q - q'}{p - p'}$

18. If $x = a(\cos t + \tan t/2)$, $y = a \sin t$, then the value of $\frac{dy}{dx}$ at $t = \frac{\pi}{4}$ is :

- (1) a (2) 0 (3) -1 (4) 1
-

19. $\frac{d}{dx} \cos^{-1}(\sec x)$ is equal to :

- (1) cosec x (2) tan x (3) sec x (4) sin x

20. The angle of intersection between two curves $x^2 = 8y$ and $y^2 = 8x$ at origin will be:

- (1) $\frac{\pi}{2}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{4}$

21. If the function $2x^3 - (x + 5)$ is an increasing function then the value x is :

- (1) $0 < x < 1$ (2) $-1 < x < 1$
(3) $x < -1$ and $x > 1$ (4) $-1 < x < -\frac{1}{2}$

22. At the point where the function $\sin^p x \cos^q x$ has maximum value is :

- (1) $x = \tan^{-1} \sqrt{pq}$ (2) $x = \tan^{-1} \sqrt{(q/p)}$
(3) $x = \tan^{-1} \sqrt{(p/q)}$ (4) $x = \tan^{-1} (p/q)$

23. The maximum value of $\frac{\log x}{x}$ will be :

- (1) $2/e$ (2) $2e$ (3) $1/e$ (4) e

24. The odds against an event is 5 : 2 and in favour of other event is 6 : 5. If the events are independent then the probability that at least one event will happen will be :

- (1) $\frac{25}{88}$ (2) $\frac{63}{88}$ (3) $\frac{52}{77}$ (4) $\frac{50}{77}$

25. A bag contains 30 balls marked 1 to 30 one ball is drawn at random the probability that the number on the ball is a multiple of 5 or 7 is :

- (1) $\frac{73}{75}$ (2) $\frac{2}{3}$ (3) $\frac{2}{75}$ (4) $\frac{1}{3}$

26. If $\mathbf{a} \times \mathbf{b} = \mathbf{b} \times \mathbf{c} \neq \mathbf{0}$ where $\mathbf{a}, \mathbf{b}, \mathbf{c}$ are coplanar then the correct statement will be :

- (1) $\mathbf{a} + \mathbf{c} = k\mathbf{a}$ (2) $\mathbf{a} + \mathbf{c} = k\mathbf{c}$
(3) $\mathbf{a} + \mathbf{c} = k\mathbf{b}$ (4) $\mathbf{a} + \mathbf{c} = \mathbf{0}$

27. Projection of vector $2\mathbf{i} + 3\mathbf{j} - 2\mathbf{k}$ on the vector $\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$ will be :

- (1) $\sqrt{14}$ (2) $\frac{3}{\sqrt{14}}$ (3) $\frac{1}{\sqrt{14}}$ (4) $\frac{2}{\sqrt{14}}$

28. $\mathbf{i} \times (\mathbf{a} \times \mathbf{i}) + \mathbf{j} \times (\mathbf{a} \times \mathbf{j}) + \mathbf{k} \times (\mathbf{a} \times \mathbf{k})$ is equal to :

- (1) $-a$ (2) a (3) $-2a$ (4) $2a$

29. The area of the region bounded by the parabola $y^2 = 4x$ and its latus rectum is :

- (1) $\frac{5}{3}$ (2) $\frac{2}{3}$ (3) $\frac{8}{3}$ (4) $\frac{4}{3}$

30. The area of the region bounded by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is :

- (1) $\frac{16}{3} a^2$ (2) $\frac{32}{3} a^2$ (3) $\frac{4}{3} a^2$ (4) $\frac{8}{3} a^2$

31. $\int_0^{\frac{\pi}{4}} (\sqrt{\tan x} + \sqrt{\cot x}) dx$ is equal to :

- (1) 2π (2) $\frac{\pi}{\sqrt{2}}$ (3) $\frac{\pi}{2}$ (4) $\sqrt{2}\pi$

32. $\int_0^1 \log \sin \left(\frac{\pi x}{2} \right) dx$ is equal to :

- (1) $-\frac{\pi}{2} \log 2$ (2) $\frac{\pi}{2} \log 2$
 (3) $-\log 2$ (4) $\log 2$

33. $\int_0^1 \tan^{-1} x dx$ is equal to :

- (1) $\frac{\pi}{2} + \log 2$ (2) $\frac{\pi}{4} - \log \sqrt{2}$
 (3) $\frac{\pi}{4} + \frac{1}{2} \log 2$ (4) $\frac{\pi}{4}$

34. $\int_0^1 \sqrt{\frac{1-x}{1+x}} dx$ is equal to :

- (1) $\pi + 1$ (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{2} + 1$ (4) $\frac{\pi}{2} - 1$

35. $\frac{dx}{\sin x + \cos x}$ is equal to :

(1) $\log \tan \left(\frac{\pi}{8+x} \right) + C$

(2) $\log \tan \left(\frac{\pi}{8} + \frac{\pi}{x} \right) + C$

$$(3) \frac{1}{\sqrt{2}} \log \tan \left(\frac{\pi}{8} + \frac{\pi}{2} \right) + C$$

(5) none of these

36. $e^x \left(\frac{1 + \sin x}{1 + \cos x} \right) dx$ is equal to :

- (1) $e^x \cot x + C$ (2) $e^x \tan x C$
 (3) $e^x \cot (x/2) + C$ (4) $e^x \tan (x/2) + C$

37. $\frac{dx}{2x^2 + x + 1}$ is equal to :

$$(1) \frac{2}{\sqrt{7}} \tan^{-1} \left(\frac{4x+1}{\sqrt{7}} \right) + C$$

$$(2) \frac{1}{2} \tan^{-1} \left(\frac{4x+1}{\sqrt{7}} \right) + C$$

$$(3) \frac{1}{\sqrt{7}} \tan^{-1} \left(\frac{4x+1}{\sqrt{7}} \right) + C$$

$$(4) \frac{1}{2\sqrt{7}} \tan^{-1} \left(\frac{4x+1}{\sqrt{7}} \right) + C$$

38. The two parts of 20 such that the product of the cube of one and the square of the other is maximum is :

- (1) 12,8 (2) 8, 12 (3) 16,4 (4) 10,10

39. The equation of the tangent to the curve $y = 2 \cos x$ at $x = \pi/4$ is:

$$(1) y - \sqrt{2} = \sqrt{2} (x - \pi/4)$$

$$(2) y + \sqrt{2} = \sqrt{2} (x + \pi/4)$$

$$(3) y - \sqrt{2} = 2\sqrt{2} (x - \pi/4)$$

—

(4) $y - \sqrt{2} = \sqrt{2} (x - \pi/4)$

40. If $u = \tan^{-1} \left\{ \frac{\sqrt{1+x^2}-1}{x} \right\}$ and $v = 2 \tan^{-1} x$ then $\frac{du}{dv}$ is equal to :

- (1) $\frac{1}{4}$ (2) 1 (3) 4 (4) 0

41. If $y = \tan^{-1} \left(\frac{\cos x}{1 + \sin x} \right)$ then dy is equal to :

- (1) 0 (2) 1 (3) $-\frac{1}{2}$ (4) $\frac{1}{2}$

42. If $f(x) = |x - 3|$, then f is :

- (1) continuous but not differentiable at $x = 3$
 (2) differentiable at $x = 3$
 (3) not differentiable at $x = 3$
 (4) not continuous $x = 2$

43. $\lim_{x \rightarrow \infty} x \sin \frac{\pi x}{4x} \cos \frac{\pi x}{4x}$ is equal to :

- (1) $\frac{\pi}{4}$ (2) $\frac{2}{\pi}$ (3) $\frac{4}{\pi}$ (4) $\frac{\pi}{2}$

44. The equation of the common tangent to the circle $x^2 + y^2 = 2$ and the parabola $y^2 = 8x$ will be :

- (1) $y = x + 2$ (2) $y = x - 2$ (3) $y = x + 2$ (4) $y = x + 1$

45. The coordinates of the ends of the latus rectum to the parabola $x^2 = 4ay$ are :

- (1) $(-2a, a), (2a, a)$ (2) $(a, -2a), (2a, a)$
 (3) $(-a, 2a), (2a, a)$ (4) $(a, 2a), (2a, -a)$

46. If the line $mx + ny = 1$ is tangent to the parabola $y^2 = 4ax$ then :

- (1) $mn = at^2$ (2) $mn = an^2$
 (3) $mn = am^2$ (3) none of these

47. If the line $mx + ny = 1$ is tangent to the circle $x^2 + y^2 = r^2$ then locus of the point (m, n) will be :

- (1) $x^2 + y^2 = 2r^2$ (3) $x^2 + y^2 = r^2$
 (3) $r^2(x^2 + y^2) = 1$ (4) $x^2 + y^2 = 1$

48. If $3x - 4y + 4 = 0$ and $6x - 8y - 7 = 0$ are the tangent line of same circle then the radius of the circle will be:

- (1) $\frac{1}{10}$ (2) $\frac{11}{10}$ (3) $\frac{3}{4}$ (4) $\frac{3}{2}$

49. The angle between the tangent lines to the circle $(x - 7)^2 + (y + 1)^2 = 25$ will be :

- (1) $\frac{\pi}{3}$ (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{3}$

50. The area of the square formed by the lines $|x| + |y| = 1$ is:

- (1) 1 square unit (2) 8 square unit
(3) 2 square unit (4) 4 square unit

51. If both the ends of a moving rod of length 1 lines on two perpendicular lines then the locus of the point which divide the rod in the ratio 1 ; 2 is :

- (1) $9x^2 + 36y^2 = 1^2$ (2) $9x^2 + 36y^2 = 41^2$
(3) $x + \frac{y}{2} = \frac{1}{3}$ (4) $\frac{x}{2} + y = \frac{1}{3}$

52. The orthocenter of the triangle whose vertices are (0, 0), (3,0) and (0,4) is :

- (1) (2,1) (2) (-1,0) (3) (0,1) (4) 0,0

53. The real part of $\sin^{-1}(e^{i\theta})$ is :

- (1) $\sin^{-1}(\sqrt{\cos \theta})$
(2) $\cos^{-1}(\sqrt{\sin \theta})$
(3) $\sin^{-1}(\sqrt{\sin \theta})$
(4) $\sin^{-1}(\sqrt{\sin \theta})$

54. The argument of $e^{-i\theta}$ is :

- (1) $e^{\sin \theta}$ (2) $e^{\cos \theta}$ (3) $-\sin \theta$ (4) $\sin \theta$

55. If ω is the cube root of unity then the value of $(1 - \omega + \omega^2)^5 + (1 + \omega - \omega^2)^5$ is :

- (1) 64 (2) 48 (3) 32 (4) 16

56. If $A = \begin{pmatrix} 3 & 2 \\ 1 & -4 \end{pmatrix}$, then $A(\text{adj } A)$ is equal to :

equal to :

- (1) $-\frac{1}{4}I$ (2) 8I (3) $-10A$ (4) $-14I$

57. If $\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0$ then the value of x is :

- (1) $\frac{11}{3}, 1$ (2) $\frac{1}{2}, 1$ (3) $\frac{2}{3}, \frac{11}{3}$ (4) $0, \frac{1}{3}$

58. If in the expansion of $(x + a)^n$ the sum of all odd terms is P and the sum of all even terms is Q then the value of $(P^2 - Q^2)$ will be :

- (1) $(x^2 - a^2)^n$ (2) $(x^2 + a^2)^n$ (3) $(x^2 + a^2)^{2n}$ (4) $(x^2 - a^2)^{2n}$

59. If $(1 + x)^n = C_0 + C_1x + C_2x^2 + \dots + C_nx^n$ then the value of $C_0^2 + C_1^2 + \dots + C_n^2$ is :

- (1) ${}^{2n}C_n$ (2) ${}^{2n}C_{n-1}$ (3) ${}^{2n}C_{n+1}$ (4) ${}^{2n}C_{2n}$

60. The number of total permutations of the letters of the word 'BANANA' are :

- (1) 24 (2) 720 (3) 120 (4) 60

61. How many ways five awards can be distributed among 4 students such that each student can win any number of awards :

- (1) 120 (2) 600 (3) 625 (4) 1024

62. The sum of the infinite terms of $1 + \frac{4}{5} + \frac{7}{5^2} + \frac{10}{5^3} + \dots$ will be:

- (1) $\frac{7}{4}$ (2) $\frac{15}{16}$ (3) $\frac{16}{35}$ (4) $\frac{35}{16}$

63. If $A_1, A_2, G_1, G_2, H_1, H_2$ are the two A.M., G.M. and H.M. between two numbers then $\frac{A_1 + A_2}{H_1 + H_2} \cdot \frac{H_1 - H_2}{G_1 + G_2}$ is equal to :

- (1) 8 (2) 1 (3) 4 (4) 0

64. If in a G.P. the $(m + n)$ th term is p and $(m - n)$ th term is q then its mth term will be:

- (1) $\sqrt{p/q}$ (2) p/q (3) pq (4) \sqrt{pq}

65. The G.M. of the roots of the equation $x^2 - 18x + y = 0$ will be :

- (1) $2\sqrt{3}$ (2) 3 (3) 9 (4) $9\sqrt{2}$

66. If in the expansion of $(1 + x)^{20}$ the coefficient of the rth and $(r + 4)$ th term are equal then the value of r will be :

- (1) 10 (2) 9 (3) 8 (4) 7

67. If $x = \log \tan \left[\frac{\pi\pi}{4} + \frac{\theta\theta}{2} \right]$ then $\tanh(x/2)$ will be :

- (1) $\tan(\theta/2)$ (2) $-\tan(\theta/2)$ (3) $-\cot(\theta/2)$ (4) $\cot(\theta/2)$

68. If the sum of the distances of variable point to the origin and from the line $x = 2$ is 4, then the locus of the variable point will be :

- (1) $x^2 + 12y = 36$ (2) $x^2 - 12y = 36$
 (3) $y^2 - 12x = 26$ (4) $y^2 + 12x = 36$

69. The equation $ax^2 + bx^2 + 2hxy + 2gx + 2fy + c = 0$ is the equation circle, if :

- (1) $ab = h, c = 0$ (2) $a = b, c = 0$
 (3) $a = b \neq 0, h = 0$ (4) $a = b = 0, h = 1$

70. The locus of the middle points of the system of chords to the circle $x^2 + y^2 = 4$ which subtends the right angle at the centre will be :

- (1) $x + y = 1$ (2) $x^2 + y^2 = 2$
 (3) $x^2 + y^2 = 1$ (4) $x + y = 2$

71. The locus of the middle point of system of the chords to the parabola $y^2 = 4ax$ which are passing through the origin is :

- (1) $x^2 = 4ay$ (2) $y^2 = 4ax$ (3) $y^2 = ax$ (4) $y^2 = 2ax$

72. The Focus of the parabola $4y^2 - 6x - 4y = 5$ is:

- (1) $\left(-\frac{1}{2}, \frac{1}{2}\right)$ (2) $\left(\frac{1}{2}, \frac{5}{8}\right)$
 (3) $\left(-\frac{5}{8}, \frac{1}{2}\right)$ (4) $\left(-\frac{8}{5}, 2\right)$

73. If the line $2x + y + \lambda = 0$ is normal to the parabola $y^2 = -8x$ then the value of λ will be :

- (1) 24 (2) -24 (3) -8 (4) -16

74. The period of $\sin^4 x + \cos^4 x$ will be :

- (1) $\frac{3\pi}{2}$ (2) 2π (3) π (4) $\frac{\pi}{2}$

75. $\lim_{x \rightarrow 1} (1-x) \tan \frac{\pi x}{2}$ is :

- (1) 0 (2) $\frac{2}{\pi}$ (3) π (4) $\frac{\pi}{2}$

76. A die is thrown two times, the probability that sum of the digits in two throws will be 7 is :

- (1) $\frac{8}{36}$ (2) $\frac{7}{36}$ (3) $\frac{5}{6}$ (4) $\frac{1}{6}$

77. The probability that a person can hit a bird is $\frac{3}{4}$. He tries 5 times, the probability that he fails all the time is :

- (1) $\frac{5}{8}$ (2) $\frac{3}{8}$ (3) $\frac{23}{24}$ (4) $\frac{1}{24}$

78. There are four letters to which four different envelopes are available. The probability that all the four letters are placed in wrong envelopes is :

- (1) $\frac{1023}{1024}$ (2) $\frac{1}{1024}$ (3) $\frac{781}{1024}$ (4) $\frac{243}{1024}$

79. If $\mathbf{a} = 2\mathbf{i} - \mathbf{j} + \mathbf{k}$, $\mathbf{b} = \mathbf{j} + \mathbf{k}$ and $\mathbf{c} = \mathbf{i} - \mathbf{k}$ then the area of the parallelogram whose diagonals are $(\mathbf{a} + \mathbf{b})$ and $(\mathbf{b} + \mathbf{c})$ will be :

- (1) $\vec{i} + \vec{j} - \vec{k}$ (2) $\vec{i} - \vec{j} + \vec{k}$

- (3) $-\vec{i} + \vec{j} + \vec{k}$ (4) $\vec{i} + \vec{j} + \vec{k}$

80. If \mathbf{a} , \mathbf{b} and \mathbf{c} are non coplanar vectors then $[\mathbf{a} + \mathbf{b}, \mathbf{b} + \mathbf{c}, \mathbf{c} + \mathbf{a}]$ is equal to :

- (1) 0 (2) $[abc]^2$ (3) $2[abc]$ (4) $[abc]$

81. if $4\mathbf{i} - 3\mathbf{j}$, $\mathbf{i} + 4\mathbf{j} - 3\mathbf{k}$ and $\mathbf{i} + \mathbf{j} + \mathbf{k}$ are the position vectors of the vertices A, B, C respectively then $\angle ABC$ is equal to :

- (1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{6}$

82. The area of the region bounded by the curve $x^2 + y^2 = 4$, line $x = \sqrt{3}y$ and the axis of x is :

- (1) π (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{2}$

83. $\frac{dx}{x(x^4 - 1)}$ is equal to

- (1) $\log \frac{x^4}{x^4 - 1} + C$ (2) $\frac{1}{4} \log \frac{x^4 - 1}{x^4} + C$

- (3) $\frac{1}{4} \log \frac{x^4}{x^4 - 1} + C$ (4) $\log \frac{x^4 - 1}{x^4} + C$

84. $\frac{dx}{3 + 4 \cos x}$ is equal to :

- (1) $\frac{1}{4} \log \left[\frac{\sqrt{7} - \tan(x/2)}{\dots} \right] + C$

$$\sqrt{7} \quad \sqrt{7} + \tan(x/2)$$

$$(2) \frac{1}{\sqrt{7}} \log \left(\frac{\tan(x/2) + \sqrt{7}}{\tan(x/2) - \sqrt{7}} \right) + C$$

$$(3) \frac{1}{\sqrt{7}} \log \left(\frac{\tan(x/2) - \sqrt{7}}{\tan(x/2) + \sqrt{7}} \right) + C$$

$$(4) \frac{1}{\sqrt{7}} \log \left(\frac{\sqrt{7} + \tan(x/2)}{\sqrt{7} - \tan(x/2)} \right) + C$$

85. $\int x \sin x \, dx$ is equal to :

- (1) $-x \cos x + \sin x + C$
- (2) $x \sin x - \cos x + C$
- (3) $x \cos x + \sin x + C$
- (4) $x \cos x - \sin x + C$

86. $\int_{-n}^n \sin x f(\cos x) \, dx$ is equal to :

- (1) 1
- (2) 0
- (3) $m \int \sin x f(\cos x) \, dx$
- (4) none of these

87. $\int_0^{\pi/2} x \cot x \, dx$ is equal to :

- (1) $-\pi \log 2$
- (2) $\pi \log 2$
- (3) $\frac{\pi}{2} \log 2$
- (4) $-\frac{\pi}{2} \log 2$

88. $\int_{-1}^1 x \tan^{-1} x \, dx$ is equal to :

- (1) 0
- (2) $\pi - 1$
- (3) $\frac{\pi}{2} + 1$
- (4) $\frac{\pi}{2} - 1$

89. $\int_0^{\pi/2} \log \sin x \, dx$ is equal to :

- (1) $-\pi \log 2$
- (2) $-\frac{\pi}{2} \log 2$
- (3) $\pi \log 2$
- (4) $\frac{\pi}{2} \log 2$

90. If the roots of the equation $ix^2 + mx + n = 0$ are in the ratio $p : q$ then $\sqrt{\frac{p}{q}} + \sqrt{\frac{q}{p}} + \sqrt{\frac{n}{i}}$ is equal to :

- (1) 0
- (2) $\frac{n}{q} \frac{n}{1}$
- (3) $\frac{p+q}{1}$
- (4) none of these

91. If the roots of the equation $x^2 - 8x + a^2 - 6a = 0$ are real then the value of a will be:

- (1) $2 \leq a \leq 8$ (2) $2 < a < 8$ (3) $-2 < a < 8$ (4) $-2 \leq a \leq 8$

92. If z_1 and z_2 are two non zero complex numbers such that $|z_1 + z_2| = |z_1| + |z_2|$ then $\text{amp}(z_1) - \text{amp}(z_2)$ is equal to :

- (1) $\pi/4$ (2) $-\pi/2$ (3) $\pi/2$ (4) 0

93. If $z = x + y iy$ and $\left| \frac{1 - iz}{z - i} \right| = 1$, the z lies on :

- (1) axis of x (2) axis of y (3) circle of radius one (4) none of these

94. The value of $|z_1 + z_2|^2 + |z_1 - z_2|^2$:

- (1) $1 [|z_1|^2 - |z_2|^2]$ (2) $2 [|z_1|^2 - |z_2|^2]$
 (3) $2 [|z_1|^2 + |z_2|^2]$ (4) $1 [|z_1|^2 + |z_2|^2]$

95. The minimum value of $|2z - 1| + |3z - 2|$ is :

- (1) $2/3$ (2) $1/3$ (3) $1/2$ (4) 0

96. If $z = x + iy$ and $|z| = 1$ ($z \neq \pm 1$) then $\frac{z - 1}{z + 1}$ is :

- (1) zero (2) purely imaginary (3) purely real (4) not defined

97. If $x + iy = \sqrt{\frac{a + ib}{c + id}}$, then $x^2 + y^2$ is equal to :

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

98. If x is real then the minimum value of $\frac{1 - x + x^2}{1 + x + x^2}$ will be :

- (1) 3 (2) $1/3$ (3) 1 (4) 0

99. If the matrix $P = \begin{pmatrix} 1 & 2 \\ -3 & 0 \end{pmatrix}$ and $Q = \begin{pmatrix} -1 & 0 \\ 2 & 3 \end{pmatrix}$ then correct statement is :

- (1) $P + Q = I$ (2) $PQ \neq QP$ (3) $Q^2 = Q$ (4) $P^2 = P$

100. If the exponential form of the complex number $-1 = \sqrt{3} e^{i\theta}$ then θ s equal to :

- (1) $\frac{-4\pi}{3}$ (2) $\frac{2\pi}{3}$ (3) $\frac{-2\pi}{3}$ (4) $\frac{8\pi}{3}$

