# MATHEMATICS

1. Three non-zero complex numbers $z_1$, $z_2$, $z_3$ satisfying
$|z_1|^2 + |z_2|^2 + |z_3|^2 = |z_1z_2| + |z_2z_3| + |z_3z_1|$ lie on a circle with centre
(A) (0, 0) (B) (1, 1)
(C) (i, i) (D) none of these

2. Number of values of $\theta \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, which satisfies the equation
$\sin\left(\frac{\pi}{2\sqrt{2}}\cos\theta\right) = \cos\left(\frac{\pi}{2\sqrt{2}}\sin\theta\right)$ is equal to
(A) 0 (B) 1
(C) 2 (D) 4

3. Im(z) is equal to
(A) $\frac{1}{2}(z+\bar{z})i$ (B) $\frac{1}{2}(z-\bar{z})$
(C) $\frac{1}{2}(\bar{z}-z)i$ (D) none of these

4. The value of $(i^8 + i)^3 + (i^8 - i)^6$ is
(A) 1 + i (B) -2 + 10i
(C) 1 + 3i (D) 1 – i

5. If abc = 8 and a, b, c > 0, then the minimum value of (2 + a) (2 + b) (2 + c) is
(A) 32 (B) 64
(C) 8 (D) 10

6. The sum of 19 terms of an A.P., whose $n^{th}$ terms is 2n + 1 is
(A) 390 (B) 399
(C) 499 (D) none of these

7. If the first term of a G.P. is 1 and the sum of the third and fifth terms is 90. Then the common ratio if G.P. is
(A) ± 1 (B) ± 2
(C) ± 3 (D) ± 4

8. The total number of real roots of the equation $2x^4 + 5x^2 + 3 = 0$ is
(A) 4 (B) 0
(C) 2 (D) 3

9. Let $\alpha, \beta, \gamma, \delta$ are the roots of equation $x^4 + x^2 + 1 = 0$ then the equation chose roots are $\alpha^2$, $\beta^2$, $\gamma^2$, $\delta^2$ is
(A) $(x^2 - x + 1)^2 = 0$ (B) $(x^2 + x + 1)^2 = 0$
(C) $x^4 - x^2 + 1 = 0$ (D) $x^2 + x + 1 = 0$

10. The number of real roots of the equation $3^{2x^2-7x+7} = 9$ is
(A) 0 (B) 2
(C) 1 (D) 4

11. If $\alpha$, $\beta$ are the roots of equation $ax^2 + bx + b = 0$, then the value of $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{b}{a}}$ is

(A) 0
(B) 1
(C) 2
(D) $2\sqrt{\frac{b}{a}}$

12. ${}^{n-1}C_3 + {}^{n-1}C_4 > {}^{n}C_3$, then value of 'n' can be
(A) 4
(B) 6
(C) 7
(D) 8

13. The number of ways of arranging the letter AAAAA BBB CCC D EE F in a row when no two C's are together is

(A) $\frac{15!}{5!(3!)2!} - 3!$
(B) $\frac{12!}{5!3!2!} \times \frac{{}^{13}P_4}{4!}$
(C) $\frac{12!}{5!3!2!} \times {}^{13}P_3$
(D) none of these

14. The number of committees of 3 members can be formed from 6 gentlemen and 4 ladies
(A) ${}^{6}C_5$
(B) ${}^{10}P_5$
(C) 252
(D) 120

15. The number of all possible selections of one or more questions from 8 given questions, each question having an alternative is
(A) $2^8 - 1$
(B) $3^8 - 1$
(C) $4^8 - 1$
(D) none of these

16. The coefficient of $x^4$ in the expansion of $(1+x+x^2+x^3)^n$ is
(A) ${}^{n}C_4$
(B) ${}^{n}C_4 + {}^{n}C_2$
(C) ${}^{n}C_4 + {}^{n}C_1 + {}^{n}C_4\,{}^{n}C_2$
(D) ${}^{n}C_4 + {}^{n}C_2 + {}^{n}C_1\,{}^{n}C_2$

17. Value of $\sum_{r=0}^{n} (2r+1)\,{}^{n}C_r$ is equal to

(A) $n.2^n$
(B) $(n + 1)2^n$
(C) $(2n + 1)2^n$
(D) none of these.

18. The value of $\frac{1}{81^n} - \frac{10}{81^n}\,{}^{2n}C_1 + \frac{10^2}{81^n}\,{}^{2n}C_2 - \frac{10^3}{81^n}\,{}^{2n}C_3 + ..... + \frac{10^{2n}}{81^n}$ is

(A) 2
(B) 0
(C) 1/2
(D) 1

19. The square roots of $1 + 2x + 3x^2 + 4x^3 + \;.\;.\;.\;.\;.\;\infty$ is
(A) $1 - x + x^2 - x^3 + \;.\;.\;.\;.\;.\;\infty$
(B) $1 + x^2 + x^4 + \;.\;.\;.\;.\;\infty$
(C) $1 - x^2 + x^4 - x^6 + \;.\;.\;.\;.\;\infty$
(D) $1 + x + x^2 + x^3 + \;.\;.\;.\;.\;\infty$

20. If $\Delta = \begin{vmatrix} \cos(\alpha+\beta) & -\sin(\alpha+\beta) & \cos 2\beta \\ \sin\alpha & \cos\alpha & \sin\beta \\ -\cos\alpha & \sin\alpha & -\cos\beta \end{vmatrix}$

then $\Delta$ is given by

(A) $\cos^2\alpha$ (B) $\sin^2\alpha$

(C) $\sin(\alpha - \beta)$ (D) 0

21. The value of $\Delta = \begin{vmatrix} a-b & b+c & a \\ b-c & c+a & b \\ c-a & a+b & c \end{vmatrix}$ is

(A) $a^3 + b^3 + c^3$ (B) 3 abc

(C) $a^3 + b^3 + c^3 - 3abc$ (D) none of these

22. If $\theta \in R$, then $\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ lies in the interval

(A) [2, 3] (B) [2, 4]

(C) [-1, 2] (D) [0, 4]

23. If $\Delta = \begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} = 0$, then a, b, c are in

(A) A. P. (B) G. P.

(C) H. P. (D) none of these

**24. The system of linear equations $x + y - z = 6$, $x + 2y - 3z = 14$ and $2x + 5y - \lambda z = 9$ ($\lambda \in R$) has a unique solution if**

(A) $\lambda = 8$ (B) $\lambda \neq 8$

(C) $\lambda = 7$ (D) $\lambda = \neq 7$

25. A square matrix $A = [a_{ij}]_{n\times n}$ is called a lower triangular matrix iff $a_{ij} = 0$ for

(A) i = j (B) i < j

(C) i > j (D) none of these

26. If $A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$, then A is

(A) iodempotent (B) involuntary

(C) nilpotent (D) scalar

27. If a matric $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ -2 & 1 \end{bmatrix}$ then AB is equal to

(A) $\begin{bmatrix} -5 & 4 \\ -4 & 5 \end{bmatrix}$ (B) $\begin{bmatrix} 5 & 4 \\ 4 & 5 \end{bmatrix}$

(C) $\begin{bmatrix} -5 & -4 \\ -4 & 5 \end{bmatrix}$ (D) None of these

28. If A, B and C be the three square matrices such that A = B + C, then det A is equal to
(A) det B + det C (B) det B
(C) det C (D) none of these

29. If $\frac{2\sin\alpha}{1+\cos\alpha+\sin\alpha} = x$, then $\frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha}$ =
(A) $\frac{1}{x}$ (B) x
(C) 1 – x (D) 1 + x

30. If $\sec\theta + \tan\theta = 1$, then one root of the equation $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$ is
(A) $\tan\theta$ (B) $\sec\theta$
(C) $\cos\theta$ (D) $\sin\theta$

31. If A, B, C are acute positive angles then $\frac{(\sin A+\sin B)(\sin B+\sin C)(\sin C+\sin A)}{\sin A\sin B\sin C}$ is
(A) < 8 (B) $\geq 8$
(C) 2 (D) none of these

32. The value of
$\cos\frac{\pi}{n} + \cos\frac{2\pi}{n} + \cos\frac{3\pi}{n} + \ldots\ldots\ldots + \cos\frac{(n-1)\pi}{n}$
(A) 0 (B) $\frac{\pi}{n}$
(C) n (D) none of these

33. The number of values of x satisfying the condition sinx + sin 5x = sin 3x in the interval $[0, \pi]$ is
(A) 6 (B) 2
(C) 10 (D) 0

34. If 2cos x + 2 cos 3x = cos y, 2 sin x + 2sin 3x = sin y, then the value of cos 2x is
(A) $-\frac{7}{8}$ (B) $\frac{1}{8}$
(C) $-\frac{1}{8}$ (D) $\frac{7}{8}$

35. If $\alpha = \sin^2\theta + \cos^4\theta$, then for all real values of $\theta$
(A) $3/4 \leq \alpha \leq 4/3$ (B) $4/3 \leq \alpha \leq 2$
(C) $3/4 \leq \alpha \leq 1$ (D) $1 \leq \alpha \leq \leq 2$

36. If $\cos\alpha + \cos\beta = a$, $\sin\alpha + \sin\beta = b$, then $\cos(\alpha+\beta)$ is equal to
(A) $\frac{2ab}{a^2+b^2}$ (B) $\frac{a^2+b^2}{a^2-b^2}$

(C) $\dfrac{a^2 - b^2}{a^2 + b^2}$ (D) $\dfrac{b^2 - a^2}{a^2 + b^2}$

37. If the angles A and B of the triangle ABC satisfy the equation $\sin A + \sin B = \sqrt{3}(\cos B - \cos A)$, then they differ by

(A) $\dfrac{\pi}{6}$ (B) $\dfrac{\pi}{3}$

(C) $\dfrac{\pi}{4}$ (D) $\dfrac{\pi}{2}$

38. If the radii of the circumcircle and incircle of an equilateral triangle are respectively 12cm and 8cm, each side is equal to

(A) 20 cm (B) 28 cm

(C) 24 cm (D) 32 cm

39. The expression $\dfrac{(a+b+c)(b+c-a)}{(c+a-b)(a+b-c)}$ is equal to

(A) $\cos^2(A/2)$ (B) $\sin^2(A/2)$

(C) $\cot^2(A/2)$ (D) $\tan^2(A/2)$

40. In a triangle ABC if $\dfrac{\cos A}{a} = \dfrac{\tan C}{c}$, then $\sin(B + C)$ is equal to

(A) cos B cos C (B) cosA cos C

(C) cosA cos B (D) sinB sinC

41 The angle of elevation of the top of a tower at any point on the ground is $\pi/6$ and after moving 20m forwards the tower it becomes $\pi/3$. The height of the tower is equal to

(A) 10 m (B) $10\sqrt{3}$m

(C) $\dfrac{10}{\sqrt{3}}$ m (D) $5\sqrt{3}$ m

42. A vertical pole subtends an angle $\tan^{-1}1/2$ at a point P on the ground. The angle subtended by the upper half of the pole at the point P is

(A) $\tan^{-1} 1/4$ (B) $\tan^{-1} 2/9$

(C) $\tan^{-1} 1/8$ (D) $\tan^{-1} 2/3$

43 A pole of height h stands at one corner of a park in the shape of an equilateral triangle. If $\alpha$ is the angle which the pole subtends at the mid point of the opposite side, the length of each side of the park is

(A) $(\sqrt{3}/2)h\cot\alpha$ (B) $(2/\sqrt{3})h\cot\alpha$

(C) $(\sqrt{3}/2)h\tan\alpha$ (D) $(2/\sqrt{3})h\tan\alpha$

44. From a point an the ground 100m away from the base of a building, the angle of elevation of the top of the building is $60^0$. Which of the following is the best approximation for the height of the building?

(A) 172m (B) 173 m

(C) 174 m (D) 175 m

45. The points P(a, b + c), Q(b, c + a) and R(c, a + b) are such that PQ = QR if
(A) a, b, c are in A.P. (B) a, b, c are in G.P.
(C) a, b, c are in H.P. (D) None of these

46. The points A(2, 3); B(3, 5), C(7, 7) and D (4, 5) are such that
(A) ABCD is a parallelogram (B) A, B, C, D are collinear
(C) D lies inside the triangle ABC (D) D lies on the boundary of the triangle ABC

47. Q, R and S are the point on the line joining the point P(a, x) and T(b, y) such that PQ = QR = RS = ST, then $\left[\frac{5a+3b}{8}, \frac{5x+3y}{8}\right]$ is the mid-point of
(A) PQ (B) QR
(C) RS (D) ST

48 The extremities of a diagonals of parallelograms are the points (3, -4) and (-6, 5). If third vertex is (-2, 1) then the coordinates of the fourth vertex are
(A) (1, 0) (B) (-1, 0)
(C) (1, 1) (D) none of these

49. If one end of diameter of the circle $2x^2 + 2y^2 - 4x - 8y + 2 = 0$ is (3,2), the other end is
(A) (2, 3) (B) (4, -2)
(C) (2, -1) (D) (-1, 2)

50. Locus of the centre of the circle which always passes through the fixed points (-a, 0) and (a, 0) is
(A) x = 1 (B) x + y = 6
(C) x + y = 2a (D) x = 0

51. The equation $x^2 + y^2 + 4x + 6y + 13 = 0$ represents
(A) a circle (B) a pair of two distinct straight lines
(C) a pair of coincident straight lines (D) a point

52. The line joining (5, 0) to (10 cos$\theta$, 12 sin$\theta$) is divided internally in the ratio 2 : 3 at P. If $\theta$ varies, then the locus of P is
(A) a pair of straight line (B) a circle
(C) a straight line (D) none of these

53. The curve described parametrically by $x = t^2 + t + 1$, $y = t^2 - t + 1$ represents
(A) a pair of straight line (B) an ellipse
(C) a parabola (D) a hyperbola

54. If $2x + y + \lambda = 0$, is a normal to the parabola $y^2 = -8x$, then $\lambda$ =
(A) 12 (B) -12
(C) 24 (D) -24

55. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x - a)$ is
(A) $90^0$ (B) $30^0$
(C) $\tan^{-1}\left|\frac{1}{2}\right|$ (D) $45^0$

56. The line y = mx + 1 is a tangent to the parabola $y^2 = 4x$ if

(A) m = 1
(B) m = 2
(C) m = 4
(D) m = 3

57. If P is a point on the ellipse $9x^2 + 36y^2 = 324$ whose foci are $S_1$ and $S_2$ then $S_1P + S_2P$ is
(A) 1
(B) 12
(C) 9
(D) 18

58. The equation $\frac{x^2}{12-k} + \frac{y^2}{8-k} = 1$ represents
(A) a hyperbola if k < 8
(B) an ellipse if k > 8
(C) a hyperbola if 8 < k < 12
(D) none of these

59. The least value of x which satisfies the equation
$\log_2 \sin x - \log_2 \cos x - \log_2(1 - \tan x) - \log_2(1 + \tan x) = -1$ is
(A) $\pi/8$
(B) $\pi/4$
(C) $\pi$
(D) none of these

60. If $\log_{10}x + \log_{10}y \geq 2$, then the smallest possible value of x + y is
(A) 10
(B) 30
(C) 20
(D) none of these

61. The value of $\log_4 2 - \log_8 2 + \log_{16} 2 + \ . \ . \ . \ .$ equals to
(A) $e^2$
(B) $\log_e 2 + 1$
(C) $\log_e 3 - 2$
(D) 1-ln2

62. The point on the hyperbola $\frac{x^2}{24} - \frac{y^2}{18} = 1$ which is nearest to the line 3x + 2y + 1 = 0 is
(A) (-6, 3)
(B) (6, -3)
(C) (-6, -3)
(D) (6, 3)

63. The line $x = at^2$ meets the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ in the real points if
(A) |t| < 2
(B) $|t| \leq 1$
(C) |t| > 1
(D) none of these

64. Consider an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and family of circle $x^2 + y^2 = r^2$ ($a^2 < r^2 < a^2 + b^2$). From any point P on any of these circles, tangents are drawn to the ellipse. The angle between these tangents is
(A) acute angle
(B) obtuse angle
(C) Right angle
(D) Data insufficient.

65. If the line ax + by + c = 0 is normal to the curve x y + 5 = 0 the
(A) a > 0 , b > 0
(B) b>0, a < 0
(C) b < 0 , a > 0
(D) none of these

66. If $\cos^{-1}\sqrt{p} + \cos^{-1}\sqrt{1-p} + \cos^{-1}\sqrt{1-q} = 3\pi/4$, then the value of q is

(A) 1/3 (B) 1/2
(C) $1/\sqrt{2}$ (D) 1

67. The number of rational numbers p/q where p, q $\in$ {1, 2, 3, 4, 5, 6} is
(A) 23 (B) 32
(C) 36 (D) none

68. If the vertices of a triangle have rational co-ordinates, then the triangle cannot be
(A) right angled (B) isosceles
(C) right angled isosceles (D) equilateral

69. Suppose a, b, c are in A.P. with common difference d, then $e^{1/c}$, $e^{b/ac}$, $e^{1/a}$ are in
(A) A.P. (B) G.P.
(C) H.P. (D) none of these

70. The real values of a for which exactly one root of the equation
$e^a x^2 - 2e^a x + e^a - 1 = 0$ lies in the interval (1, 2) are given by
(A) $a < 0$ (B) $a < 1$
(C) $a > 0$ (D) $a > 1$

71. The point of intersection of the lines $\frac{x}{a} + \frac{y}{b} = 1$ and $\frac{x}{b} + \frac{y}{a} = 1$ lies on
(A) $2x - y = 0$ (B) $(x + y)(a + b) = 2ab$
(C) $(lx + my)(a + b) = (l + m)a^2b^2$ (D) $(lx - my)(a - b) = (l - m)ab$

72. All the chords of curve $3x^2 - y^2 - 2x + 4y = 0$ which subtend a right angle at origin, pass through a fixed point whose coordinates are
(A) (1, -2) (B) (2, -1)
(C) (1, -1) (D) (2, 0)

73. If $\omega$ is an imaginary seventh root of unity, then $\log_2 |\omega + \omega^2 + \ldots\ldots + \omega^6|$ is equal to
(A) 1 (B) 0
(C) -1 (D) 2

74. The value of $\sum_{r=1}^{n} \frac{r^2 + 3r + 1}{r^2 (r+1)^2}$ is
(A) $\frac{2n^2 + 3n}{(n+1)^2}$ (B) $\frac{2n+3}{(n+1)^2}$
(C) $\frac{4n^2 + 1}{(n+1)^2 n^2}$ (D) none of these

75. In a poisson distribution P(x = 2) = P(x = 1) then value of P(x = 0) is
(A) e (B) $e^{-1}$
(C) $e^{-2}$ (D) 1

**76.** If $\begin{bmatrix} x+y & y \\ 2x & x-y \end{bmatrix} \begin{bmatrix} 2 \\ -1 \end{bmatrix} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$, then $xy$ is equal to
(a) $-5$ (b) 5 (c) 4 (d) 6

**77.** If cos $(x - y)$, cos $x$ and cos $(x + y)$ are in H.P., then $\left|\cos x \sec\frac{y}{2}\right|$ equals

(a) 1 (b) 2 (c) $\sqrt{2}$ (d) none of these

**78.** If $\cos\alpha = \frac{1}{2}\left(x + \frac{1}{x}\right), \cos\beta = \frac{1}{2}\left(y + \frac{1}{y}\right)$, then cos $(\alpha - \beta)$ is equal to

(a) $\frac{x}{y} + \frac{y}{x}$ (b) $xy + \frac{1}{xy}$ (c) $\frac{1}{2}\left(\frac{x}{y} + \frac{y}{x}\right)$ (d) none of these

**79.** The number of solutions of $\sin^2\theta + 3\cos\theta = 3$ in $[-\pi, \pi]$ is

(a) 4 (b) 2 (c) 0 (d) none of these

**80.** 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) $\frac{7\pi}{20}$ (c) $\frac{7\pi}{10}$ (d) none of these

**81.** The solution set of $\log_2|4 - 5x| > 2$ is

(a) $\left(\frac{8}{5}, \infty\right)$ (b) $\left(\frac{4}{5}, \frac{8}{5}\right)$

(c) $(-\infty, 0) \cup \left(\frac{8}{5}, \infty\right)$ (d) none of these

**82.** In a $\Delta ABC$, $(c + a + b)(a + b - c) = ab$, then the measure of $\angle C$ is

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{2\pi}{3}$ (d) none of these

**83.** A vertical lamppost, 6 m high, stands at a distance of 2 m from a wall, 4 m high. A 1.5 m tall man starts to walk away from the wall on the other side of the wall, in line with the lamppost. The maximum distance to which the man can walk remaining in the shadow is

(a) $\frac{5}{2}$ m (b) $\frac{3}{2}$ m (c) 4 m (d) none of these

**84.** The equation of the straight line which bisects the intercepts made by the axes on the lines $x + y = 2$ and $2x + 3y = 6$ is

(a) $2x = 3$ (b) $y = 1$ (c) $2y = 3$ (d) $x = 1$

**85.** If the lines $y - x = 5$, $3x + 4y = 1$ and $y = mx + 3$ are concurrent, then the value of $m$ is

(a) $\frac{19}{5}$ (b) 1 (c) $\frac{5}{19}$ (d) none of these

**86.** A point on the line $y = x$ whose perpendicular distance from the line $\frac{x}{4}+\frac{y}{3}=1$ is 4, has the co-ordinates

(a) $\left(\frac{8}{7},\frac{8}{7}\right)$ (b) $\left(\frac{32}{7},\frac{32}{7}\right)$ (c) $\left(\frac{3}{2},\frac{3}{2}\right)$ (d) none of these

**87.** If $2(x^2+y^2)+4\lambda x+\lambda^2=0$ represents a circle of meaningful radius then the range of real values of $\lambda$ is

(a) $R$ (b) $(0, \infty)$ (c) $(-\infty, 0)$ (d) none of these

**88.** If the line $\lambda x + \mu y = 1$ is a normal to the circle $2x^2+2y^2-5x+6y-1=0$, then

(a) $5\lambda - 6\mu = 2$ (b) $4 + 5\mu = 6\lambda$ (c) $4 + 6\mu = 5\lambda$ (d) none of these

**89.** If $(2, -8)$ is an end of a focal chord of the parabola $y^2 = 32x$, then the coordinates of other end of the chord is

(a) (32, 32) (b) (32, – 32) (c) (–2, 8) (d) none of these

**90.** The triangle formed by the tangents to a parabola $y^2 = 4ax$ at the ends of the latus rectum and the double ordinate through the focus is

(a) equilateral
(b) isosceles
(c) right-angled isosceles
(d) dependent on the value of a for its classification

**91.** If two foci of an ellipse be (– 2, 0) and (2, 0) and its eccentricity is $\frac{2}{3}$, then the ellipse has the equation

(a) $5x^2+9y^2=45$ (b) $9x^2+5y^2=45$
(c) $5x^2+9y^2=90$ (d) $9x^2+5y^2=90$

**92.** The foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ and the hyperbola $\frac{x^2}{144}-\frac{y^2}{81}=\frac{1}{25}$ coincide, then the value of $b^2$ is

(a) 5 (b) 7 (c) 9 (d) 1

**93.** The domain of the function $f(x) = \sin^{-1}(x+[x])$, where [.] denotes the greatest integer function, is

(a) [0, 1) (b) [– 1, 1] (c) (–1, 0) (d) none of these

**94.** Let $f(x) = x + n - [x+n]+\tan\frac{\pi x}{2}$, where $[x]$ is the greatest integer $\le x$ and $n \in N$, then $f(x)$ is

(a) a periodic function with period 1 (b) a periodic function with period 4

(c) not a periodic function (d) a periodic function with period 2

**95.** If the function $f : R \to R$ be such that $f(x) = x - [x]$, (where [.] denotes the greatest integer function), then $f^{-1}(x)$ is

(a) $\frac{1}{x-[x]}$ (b) $[x]-x$ (c) not defined (d) none of these

**96.** If $x = e^{y+e^{y+\ldots\ldots \text{to} \infty}}$, then $\frac{dy}{dx}$ is

(a) $\frac{x}{1+x}$ (b) $\frac{1}{x}$ (c) $\frac{1-x}{x}$ (d) none of these

**97.** $\lim_{x\to 0}\left\{\frac{\log_e(1+x)}{x^2}+\frac{x-1}{x}\right\}$ is equal to

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) 1 (d) none of these

**98.** If $f(x) = |x-1| - [x]$, (where [.] denotes the greatest integer function), then

(a) $f(1+0) = -1, f(1-0) = 0$ (b) $f(1+0) = 0 = f(1-0)$

(c) $\lim_{x\to 1} f(x)$ exists (d) none of these

**99.** Let $h(x) = \min\{x, x^2\}$ for every real number $x$. Then which of the following is false?

(a) $h$ is continuous for all $x$ (b) $h$ is differentiable for all $x$

(c) $h'(x) = 1$ for all $x > 1$ (d) $h$ is not differentiable at two values of $x$

**100.** The equation of a curve is given by $x = e^t \sin t$, $y = e^t \cos t$. The inclination of the tangent to the curve at the point $t = \frac{\pi}{4}$ is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) 0