PAPER – II
MATHEMATICS

1. A class has 175 students. The following data shows the number of students opting one or more subjects. Maths 100, Physics 70, Chemistry 78, Maths and Physics 30, Maths and Chemistry 38, Physics and Chemistry 23, Maths, Physics and Chemistry 18. How many have opted for Maths alone?

(a) 35 (b) 48 (c) 50 (d) 22

2. The void relation on a set A is

(a) reflexive (b) symmetric and transitive

(c) reflexive and transitive (d) reflexive and symmetric

3. If $e^{f(x)} = \frac{10+x}{10-x}, x \in (-10, 10)$ and $f(x) = kf\left(\frac{200x}{100+x^2}\right)$, then $k =$

(a) 0.5 (b) 0.6 (c) 0.7 (d) 0.8

4. On the set of integers Z, define $f : Z \to Z$ as follows $f(x) = \begin{cases} \frac{x}{2} & \text{if } x \text{ is even} \\ 0 & \text{if } x \text{ is odd} \end{cases}$, than f is

(a) onto but not one-one (b) one-one and onto

(c) one-one but not onto (d) into

5. If z is a complex number such that $|z| = 4$ and arg $(z) = \frac{5\pi}{6}$, then z is equal to

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

6. If $|z+\bar{z}| = |z-\bar{z}|$, then the locus of z is a

(a) pair of straight lines (b) rectangular hyperbola

(c) straight line (d) set of four straight line

7. If x, a, b, c are real and $(x-a+b)^2+(x-b+c)^2 = 0$, then a, b, c are in

(a) H.P. (b) G.P. (c) A.P. (d) none of these

8. The conditions that the equation $ax^2+bx+c=0$ has both roots positive is that

(a) a, b and c are of same sign and $D > 0$

(b) a and b are of same sign and $D > 0$

(c) b and c have the same sign opposite to that of a and $D > 0$

(d) a and c have the same sign opposite to that of b and $D > 0$

9. Solution of $|x-1| \geq |x-3|$ is

(a) $x \leq 2$ (b) $x \geq 2$ (c) [1, 3] (d) none of these

10. If 1, $\log_9(3^{1-x}+2), \log_3(4\cdot 3^x-1)$ are in A.P., then x equals

(a) $\log_3 4$ (b) $1-\log_4 3$ (c) $1-\log_3 4$ (d) $\log_4 3$

11. The sum of all 2 digit odd numbers is
(a) 2475 (b) 2530 (c) 4905 (d) 5049

12. Maximum value of $\sin^4\theta+\cos^6\theta$ is
(a) $\frac{3}{4}$ (b) 1 (c) $\frac{1}{2}$ (d) none of these

13. If 3 sin x + 4 cos x = 5 then 4 sin x – 3 cos x is equal to
(a) 0 (b) 1 (c) 5 (d) none of these

14. The most general value of θ which satisfies sin θ = $\frac{1}{2}$, tan θ = $\frac{1}{\sqrt{3}}$ is
(a) $2n\pi+\frac{\pi}{6}$ (b) $2n\pi+\frac{\pi}{4}$ (c) $2n\pi+\frac{\pi}{3}$ (d) $2n\pi+\frac{\pi}{2}$

15. If $b + c = 3a$, then the value of $\cot\frac{B}{2}\cot\frac{C}{2}$ is equal to
(a) 1 (b) 2 (c) $\sqrt{3}$ (d) $\sqrt{2}$

16. A man standing on a horizontal plane observes the angle of elevation of the top of a tower to be α. After walking a distance equal to double the height of the tower, towards the tower, the angle of elevation becomes 2α, than α is
(a) $\frac{\pi}{18}$ (b) $\frac{\pi}{12}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{2}$

17. The equation $\sin^{-1}x = 2\sin^{-1}a$ has a solution
(a) in all values of a (b) $|a|<\frac{1}{2}$ (c) $|a|\geq\frac{1}{\sqrt{2}}$ (d) $|a|\leq\frac{1}{\sqrt{2}}$

18. Let A (2, – 3) and B (–2, 1) be the vertices of a triangle ABC. If the centroid of this triangle moves on the line $2x + 3y = 1$, then the locus of the vertex C will be
(a) $2x + 3y = 9$ (b) $2x – 3y = 7$ (c) $3x + 2y = 5$ (d) $3x – 2y = 3$

19. The line $x + y = 4$ divides the line joining the points (– 1, 1) and (5, 7) in the ratio
(a) 2 : 3 (b) 1 : 2 (c) 1 : 1 (d) 4 : 3

20. The pair of points which lie on the same side of the straight line $3x – 8y – 7 = 0$ is
(a) (0, – 1) ; (0 , 0) (b) (24, – 3) ; (1, 1)
(c) (– 1, – 1) ; (3, 7) (d) (0, 1) ; (3, 0)

21. The angle between two tangents drawn from the origin to the circle $(x-7)^2+(y+1)^2=25$ is

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{2}$ (d) 0

22. The equation of the circle having its centre on the line $x + 2y - 3 = 0$ and passing through the points of intersection of the circles $x^2+y^2-2x-4y+1=0$ and $x^2+y^2-4x-2y+4=0$ is

(a) $x^2+y^2-6x+7=0$ (b) $x^2+y^2-3y+4=0$

(c) $x^2+y^2-2x-2y+1=0$ (d) $x^2+y^2-2x-4y+4=0$

23. If $2x^2+\lambda xy+2y^2+(\lambda-4)x+6y-5=0$ is the equation of a circle then its radius is

(a) $3\sqrt{2}$ (b) $2\sqrt{3}$ (c) $2\sqrt{2}$ (d) none of these

24. The normal to the parabola $y^2=8x$ at the point (2, 4) meets the parabola again at the point

(a) (– 18, – 12) (b) (– 18, 12) (c) (18, 12) (d) (18, – 12)

25. The equation of the directrix of the parabola $y^2+4y+4x+2=0$ is

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

26. The angle between pair of tangents drawn to the ellipse $3x^2+2y^2=5$ from the point (1, 2) is

(a) $\tan^{-1}\frac{12}{5}$ (b) $\tan^{-1}\frac{6}{\sqrt{5}}$ (c) $\tan^{-1}\frac{12}{\sqrt{5}}$ (d) $\tan^{-1}\frac{\sqrt{12}}{5}$

27. The equation of the hyperbola whose foci are (6, 5), (– 4, 5) and eccentricity $\frac{5}{4}$ is

(a) $\frac{(x-1)^2}{16}-\frac{(y-5)^2}{9}=1$ (b) $\frac{x^2}{16}-\frac{y^2}{9}=1$

(c) $\frac{(x-1)^2}{16}-\frac{(y-5)^2}{9}=-1$ (d) none of these

28. 10 different letters of English alphabet are given. Words of 5 letters are formed from these given letters. How many words are formed when at least one letter is repeated?

(a) 69760 (b) 98748 (c) 96747 (d) 97147

29. Total number of four digit odd numbers that can be formed using 0, 1, 2, 3, 5, 7 are (repetition allowed)

(a) 216 (b) 375 (c) 400 (d) 720

30. $({}^{10}C_0)^2-({}^{10}C_1)^2+.....-({}^{10}C_9)^2+({}^{10}C_{10})^2$ equals

(a) ${}^{10}C_5$ (b) $-\,{}^{10}C_5$ (c) $({}^{10}C_5)^2$ (d) $(10\,!)^2$

31. The coefficient of x^{32} in the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$ is

(a) $-{}^{15}C_3$ (b) ${}^{15}C_4$ (c) $-{}^{15}C_5$ (d) ${}^{15}C_2$

32. The value of $\begin{bmatrix} 7 & 1 & 2 \\ 9 & 2 & 1 \end{bmatrix}\begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix} + 2\begin{bmatrix} 4 \\ 2 \end{bmatrix}$ is equal to

(a) $\begin{bmatrix} 43 \\ 44 \end{bmatrix}$ (b) $\begin{bmatrix} 43 \\ 45 \end{bmatrix}$ (c) $\begin{bmatrix} 45 \\ 44 \end{bmatrix}$ (d) none of these

33. The value of $\begin{vmatrix} a+b & a+2b & a+3b \\ a+2b & a+3b & a+4b \\ a+4b & a+5b & a+6b \end{vmatrix}$ is equal to

(a) $a^3+b^3+c^3-3abc$ (b) $a^3+b^3+c^3$
(c) 0 (d) none of these

34. If I_3 is the identity matrix of order 3, then I_3^{-1} is

(a) 0 (b) $3I_3$ (c) I_3 (d) does not exist

35. Domain of $\sin^{-1}\left[\log_3\left(\frac{x}{3}\right)\right]$ is

(a) [1, 9] (b) [– 1, 9] (c) [– 9, 1] (d) [– 9, – 1]

36. Range of $f(x) = \cos 2x - \sin 2x$, is the set

(a) $[-\sqrt{2}, \sqrt{2}]$ (b) [– 1, 1] (c) [– 2, 2] (d) none of these

37. $\lim_{x \to 1} \frac{\sin(e^{x-1}-1)}{\log x}$ is

(a) 0 (b) 1 (c) e (d) none of these

38. If the function $f(x) = \begin{cases} \frac{x^2-(A+2)x+A}{x-2} & \text{for } x \neq 2 \\ 2 & \text{for } x = 2 \end{cases}$ is continuous at $x = 2$, then

(a) $A = 0$ (b) $A = 1$ (c) $A = -1$ (d) none of these

39. Which of the following functions is differentiable at $x = 0$?

(a) $\cos(|x|) + |x|$ (b) $\cos(|x|) - |x|$
(c) $\sin(|x|) + |x|$ (d) $\sin(|x|) - |x|$

40. Left hand derivative of $\sec^{-1}\left\{\frac{1}{2x^2-1}\right\}$ with respect to $\sqrt{1+3x}$ at $x = -\frac{1}{3}$ is

(a) 0 (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) does not exist

41. If $f(x) = xe^{x(1-x)}$, then $f(x)$ is

(a) increasing on $\left[-\frac{1}{2}, 1\right]$ (b) decreasing on R

(c) increasing on R (d) decreasing on $\left[-\frac{1}{2}, 1\right]$

42. If $f(x) = x(x-2)(x-4)$, $1 \le x \le 4$, then a number satisfying the conditions of the Lagrange's mean value theorem is

(a) 1 (b) 2 (c) $\frac{5}{2}$ (d) $\frac{7}{2}$

43. $\int \frac{1+x+\sqrt{x+x^2}}{\sqrt{x}+\sqrt{1+x}}\,dx$ is equal to

(a) $\frac{1}{2}\sqrt{1+x}+C$ (b) $\frac{2}{3}(1+x)^{3/2}+C$

(c) $\sqrt{1+x}+C$ (d) $2(x+1)^{3/2}+C$

44. $\int_0^2 x^2[x]\,dx$ is equal to

(a) $\frac{5}{3}$ (b) $\frac{7}{3}$ (c) $\frac{8}{3}$ (d) $\frac{4}{3}$

45. If $f(x) = \int_{x^2}^{x^3} \frac{dt}{\log t}$; $x > 0$, then

(a) $f'(x) = -\frac{1}{6}\log x$ (b) f is an increasing function

(c) f has minimum at $x = 1$ (d) none of these

46. The area bounded by the curve $y = 4x - x^2$ and x-axis is

(a) $\frac{30}{7}$ sq. units (b) $\frac{31}{7}$ sq. units (c) $\frac{32}{3}$ sq. units (d) $\frac{34}{3}$ sq. units

47. The solution of the equation $\frac{dy}{dx} = \frac{x(2\log x+1)}{\sin y + y\cos y}$ is

(a) $y \sin y = x^2 \log x + \frac{x^2}{2} + c$ (b) $y \cos y = x^2 (\log x + 1) + c$

(c) $y \cos y = x^2 \log x + \frac{x^2}{2} + c$ (d) $y \sin y = x^2 \log x + c$

48. The probability of a man hitting a target is $\frac{3}{4}$. He tries 5 times. The probability that the target will be hit at least 3 times, is

(a) $\frac{291}{364}$ (b) $\frac{371}{464}$ (c) $\frac{471}{502}$ (d) $\frac{459}{512}$

49. The mean and variance of a binomial variable X are 2 and 1 respectively, then $P(X \geq 1)$ is

(a) $\frac{2}{3}$ (b) $\frac{4}{5}$ (c) $\frac{7}{8}$ (d) $\frac{15}{16}$

50. In 324 throws of 4 dice, the expected number of times 3 sixes occur is

(a) 81 (b) 5 (c) 9 (d) 31

51. If $\vec{a} = -3\hat{i} + 7\hat{j} + 5\hat{k}, \vec{b} = -3\hat{i} + 7\hat{i} - 3\hat{k}$ and $\vec{c} = 7\hat{i} - 5\hat{j} - 3\hat{k}$ are three coterminous edges of a parallelepiped, then its volume is

(a) 108 (b) 210 (c) 272 (d) 308

52. If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar unit vectors such that $\vec{a} \times (\vec{b} \times \vec{c}) = \frac{\vec{b} + \vec{c}}{\sqrt{2}}$, then angle between $\vec{a}$ and $\vec{b}$ is

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

53. The perpendicular distance of the point (2, 4, –1) from the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$ is

(a) 3 (b) 5 (c) 7 (d) 9

54. The equation of sphere, which passes through the intersection of the sphere $x^2 + y^2 + z^2 = 9$ and the plane $2x + 3y + 4z = 5$ and through the point (1, 2, 3) is

(a) $3(x^2 + y^2 + z^2) - 2x - 3y - 4z - 22 = 0$ (b) $(x^2 + y^2 + z^2) - 2x - 3y - 4z - 22 = 0$

(c) $3(x^2 + y^2 + z^2) + 2x + 3y + 4z - 22 = 0$ (d) $3(x^2 + y^2 + z^2) - 2x - 3y - 4z + 22 = 0$

55. A particle has three velocities 5 m/sec, 10 m/sec and 15 m/sec inclined at angles of 120º to one another. The resultant velocity is

(a) $5\sqrt{3}, 30^\circ$ (b) $5\sqrt{3}, 210^\circ$ (c) 5, 210º (d) none of these

56. A parachute weighing 1 kg falling with uniform acceleration from rest describes 16 m in first 4 secs. The resultant pressure of air on the parachute is

(a) 8.7 N (b) 7.8 N (c) 9.8 N (d) none of these

57. The maximum value of $z = 5x + 3y$, subject of constraints $5x + 2y \le 10$, $x \ge 0$, $y \ge 0$ is

(a) 6 (b) 10 (c) 15 (d) 25

58. Ranks of 10 students of a class in two subjects are (1, 10), (2, 9), (3, 8), (4, 7), (5, 6), (6, 5), (7, 4), (8, 3), (9, 2), (10, 1), then rank correlation coefficient is

(a) 0 (b) – 1 (c) 1 (d) 0.5

59. If $4^{\log_9 3} + 9^{\log_2 4} = 10^{\log_x 83}$, $(x \in R)$, then x is

(a) 4 (b) 9 (c) 10 (d) none of these

60. If $f(x) = x^\alpha \log x$ and $f(0) = 0$, then the value of α for which Rolle's theorem can be applied in [0, 1], is

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

61. If $4a^2 + 9b^2 + 16c^2 = 2(3ab + 6bc + 4ca)$, where a, b, c are nonzero numbers, then a, b, c are in

(a) A.P. (b) G.P. (c) H.P. (d) none of these

62. Let a, b be two positive numbers, where $a > b$ and 4 × G.M. = 5 × H.M. for the numbers. Then a is

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

63. The solution set of $\left|\frac{x+1}{x}\right| + |x+1| = \frac{(x+1)^2}{|x|}$ is

(a) $\{x \mid x \ge 0\}$ (b) $\{x \mid x > 0\} \cup \{-1\}$

(c) $\{-1, 1\}$ (d) $\{x \mid x \ge 1 \text{ or } x \le -1\}$

64. If one root of the equation $(k^2 + 1)x^2 + 13x + 4k = 0$ is reciprocal of the other then k has the value

(a) $-2 + \sqrt{3}$ (b) $2 - \sqrt{3}$ (c) 1 (d) none of these

65. If $\frac{1}{4-3i}$ is a root of $ax^2+bx+1=0$, where *a*, *b* are real, then

(a) $a=25, b=-8$ (b) $a=25, b=8$ (c) $a=5, b=4$ (d) none of these

66. If $(x-1)^4-16=0$ then the sum of non real complex values of *x* is

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

67. If $e^{i\theta}=\cos\theta+i\sin\theta$ then for the ΔABC, $e^{iA}.e^{iB}.e^{iC}$ is

(a) $-i$ (b) 1 (c) -1 (d) none of these

68. The total number of words that can be made by writing the letters of the word PARAMETER so that no vowel is between two consonants is

(a) 1440 (b) 1800 (c) 2160 (d) none of these

69. In a polygon the number of diagonals is 54. The number of sides of the polygon is

(a) 10 (b) 12 (c) 9 (d) none of these

70. If $\Delta_1=\begin{vmatrix}1&1&1\\a&b&c\\a^2&b^2&c^2\end{vmatrix}, \Delta_2=\begin{vmatrix}1&bc&a\\1&ca&b\\1&ab&c\end{vmatrix}$ then

(a) $\Delta_1+\Delta_2=0$ (b) $\Delta_1+2\Delta_2=0$ (c) $\Delta_1=\Delta_2$ (d) none of these

71. The system of equations $2x-y+z=0$, $x-2y+z=0$ and $\lambda x-y+2z=0$ has infinite number of nontrivial solutions for

(a) $\lambda=1$ (b) $\lambda=5$ (c) $\lambda=-5$ (d) no real value of λ

72. If the coefficients of the (*m* + 1)th term and the (*m* + 3)th term in the expansion of $(1+x)^{20}$ are equal then the value of *m* is

(a) 10 (b) 8 (c) 9 (d) none of these

73. The coefficient of x^6 in $\{(1+x)^6+(1+x)^7+.......+(1+x)^{15}\}$ is

(a) ${}^{16}C_9$ (b) ${}^{16}C_5-{}^{6}C_5$ (c) ${}^{16}C_6-1$ (d) none of these

74. The sum $\frac{1}{2}\,{}^{10}C_0-{}^{10}C_1+2.{}^{10}C_2-2^2.{}^{10}C_3+....+2^9.{}^{10}C_0$ is equal to

(a) $\frac{1}{2}$ (b) 0 (c) $\frac{1}{2}.3^{10}$ (d) none of these

75. If $A=\begin{bmatrix}1&\omega&\omega^2\\\omega&\omega^2&1\\\omega^2&1&\omega\end{bmatrix}, B=\begin{bmatrix}\omega&\omega^2&1\\\omega^2&1&\omega\\\omega&\omega^2&1\end{bmatrix}$ and $C=\begin{bmatrix}1\\\omega\\\omega^2\end{bmatrix}$ where ω is the complex cube root of 1 then $(A+B)C$ is equal to

(a) $\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

76. $\sum_{n=1}^{\infty} \frac{1}{2n(2n+1)}$ is equal to

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

77. If $|x|<1$, the coefficient of x^3 in the expansion of $\frac{1}{e^x.(1+x)}$ is

(a) $\frac{8}{3}$ (b) $-\frac{8}{3}$ (c) $-\frac{11}{6}$ (d) none of these

78. The minimum value of $\cos 2\theta + \cos\theta$ for real values of θ is

(a) $-\frac{9}{8}$ (b) 0 (c) -2 (d) none of these

79. If $\tan\frac{\alpha}{2}$ and $\tan\frac{\beta}{2}$ are the roots of the equation $8x^2-26x+15=0$ then $\cos(\alpha+\beta)$ is equal to

(a) $-\frac{627}{725}$ (b) $\frac{627}{725}$ (c) -1 (d) none of these

80. Let $f(x)=\sec^{-1}x+\tan^{-1}x$. Then $f(x)$ is real for

(a) $x\in[-1,1]$ (b) $x\in R$

(c) $x\in(-\infty,-1]\cup[1,\infty)$ (d) none of these

81. The value of $\tan\left\{2\tan^{-1}\frac{1}{5}-\frac{\pi}{4}\right\}$ is

(a) 0 (b) 1 (c) $\frac{7}{17}$ (d) none of these

82. The number of solutions of $\log_2(x+5)=6-x$ is

(a) 2 (b) 0 (c) 3 (d) none of these

83. In a ΔABC, $a=5, b=4$ and $\tan\frac{C}{2}=\sqrt{\frac{7}{9}}$. The side c is

(a) 6 (b) 3 (c) 2 (d) none of these

84. If in a ΔABC, $3a=b+c$ then $\tan\frac{B}{2}.\tan\frac{C}{2}$ is equal to

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

85. A family of lines is given by $(1+2\lambda)x+(1-\lambda)y+\lambda=0, \lambda$ being the parameter. The line belonging to this family at the maximum distance from the point (1, 4) is

(a) $4x-y+1=0$ (b) $33x+12y+7=0$

(c) $12x+33y=7$ (d) none of these

86. The combined equation of the pair of lines through the point (1, 0) and parallel to the lines represented by $2x^2-xy-y^2=0$ is

(a) $2x^2-xy-2y^2+4x-y=6$ (b) $2x^2-xy-y^2-4x-y+2=0$

(c) $2x^2-xy-y^2-4x+y+2=0$ (d) none of these

87. A ray of light incident at the point (–2, –1) gets reflected from the tangent at (0, –1) to the circle $x^2+y^2=1$. The reflected ray touches the circle. The equation of the line along which the incident ray moved is

(a) $4x-3y+11=0$ (b) $4x+3y+11=0$ (c) $3x+4y+11=0$ (d) none of these

88. The equation of a circle C_1 is $x^2+y^2-4x-2y-11=0$. A circle C_2 of radius 1 rolls on the outside of the circle C_1. The locus of the centre of C_2 has the equation

(a) $x^2+y^2-4x-2y-20=0$ (b) $x^2+y^2+4x+2y-20=0$

(c) $x^2+y^2-3x-y-11=0$ (d) none of these

89. The length of the latus rectum of the parabola $x=ay^2+by+c$ is

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

90. The H.M. of the segments of a focal chord of the parabola $y^2=4ax$ is

(a) $4a$ (b) $2a$ (c) a (d) a^2

91. The centre of the conic section $14x^2-4xy+11y^2-44x-58y+71=0$ is

(a) (2, 3) (b) (2, –3) (c) (–2, 3) (d) (–2, –3)

92. P is a variable point on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=2$ whose foci are F_1 and F_2. The maximum area (in unit^2) of the Δ PFF′ is

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

93. If the tangent to the ellipse $x^2+4y^2=16$ at the point 'ϕ' is a normal to the circle $x^2+y^2-8x-4y=0$ then ϕ

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

94. If $f(x)=\frac{1}{1-x}, x\neq 0, 1,$ then the graph of the function $y=f\{f(f(x))\}, x>1,$ is

(a) a circle (b) an ellipse

(c) a straight line (d) a pair of straight lines

95. Let $f:(-\infty,1]\to(-\infty,1]$ such that $f(x)=x(2-x)$. Then $f^{-1}(x)$ is

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

96. The derivative of $\tan^{-1}\frac{\sqrt{1+x^2}-1}{x}$ with respect to $\tan^{-1}x$ is

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

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

(a) 1 (b) 0 (c) $\frac{1}{2}$ (d) none of these

98. Let $s_n=\frac{1}{1.4}+\frac{1}{4.7}+\frac{1}{7.10}+.....$ to n terms. Then $\lim_{n\to\infty}s_n$ is equal to

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

99. Let $y=|x|+|x-2|$. Then $\frac{dy}{dx}$ at x = 2 is

(a) 2 (b) 0 (c) does not exist (d) none of these

100. A function $f(x)$ is defined as below $f(x)=\frac{\cos(\sin x)-\cos x}{x^2}$, $x\neq 0$ and $f(0)=a$. $f(x)$ is continuous at x = 0 if a equals

(a) 0 (b) 4 (c) 5 (d) 6