1. If a, b, c are in GP, then $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in

(A) AP (B) GP (C) HP (D) none of these

2. The sum to infinity of the series $1 + \frac{4}{5} + \frac{7}{5^2} + \frac{10}{5^3} + \cdots$ is

(A) $\frac{35}{16}$ (B) $\frac{11}{8}$ (C) $\frac{39}{35}$ (D) $\frac{7}{8}$

3. The set B-A is a subset of ___

a) $\overline{A}$ b) $\overline{B}$ c) $A \cap B$ d)Null set

4. The converse of the statement " if $3 + 3 = 6$, then I am the president of USA "

(A) If $3 + 3 \neq 6$, then I am the president of USA

(B) If $3 + 3 = 6$, then I am not the president of USA

(C) If I am the president of USA, then$3 + 3 = 6$

(D) If $3 + 3 = 6$, then I am not the president of USA

5. The number of elements present in $\{1,2,3,1,2\}$

(A) 3 (B) 5

(C) 4 (D) 2

6. The relation R defined on the set $X = \{4,5,6\}$ by $R = \{(4,4), (5,5), (6,6)\}$ is

(A) reflexive (B) not symmetric

(C) not transitive (D) identity

7. If $A \subset B, B \subset C$ then

(A) $A \cup C = A$ (B) $A \cap C = C$ (C) $A \cap C = A$ (D) none of these

8 . The range of the function $f(x) = \frac{2x^2}{1+x^2}$ is

(A) $0 \leq x < 1$ (B) $0 < x < 1$ (C) $0 \leq x < \frac{1}{2}$ (D) $0 \leq x < 2$

9. If $x, y \in \mathbb{R}, 2xy$ rational , y irrational , and x rational, then

(A) $x > 0$ (B) $x = 0$ (C) $x < 0$ (D) $x \neq 0$

10. If $5 + (a + ib) = 8 + 5i$, then

(A) $a = 3, b = 5$ (B) $a = 8, b = 5$

(C) $a = 5, b = 5$ (D) $a = 8, b = 8$

11. A square root of $3 + 4i$ is

(A) $\sqrt{3} + i$ (B) $2 + i$ (C) $-2 + i$ (D) none of these

12. The number of 3 digits can be formed by using the digit 1 to 7 (if repetition) of digits is not allowed is

(A) 3^7 (B) 7^3 (C) 60 (D) 210

13. A group consists of 5 girls and 6 boys. The number of ways a team of 4 members be selected with no girl in the team is
(A) 30 (B) 15 (C) 10 (D) None of these

14. If the coefficient of a in $\left(a^2+\frac{m}{a}\right)^5$ is 270, then the value of m is
(A) 3 (B) 4 (C) 5 (D) none of these

15. If ${}^8C_n - {}^7C_3 = {}^7C_2$, then n is equal to
(A) 8 (B) 4 (C) 3 (D) 6

16. If x is real, then the maximum value of $6+4x-x^2$ is
(A) 6 (B) 7 (C) 10 (D) 9

17. The quadratic equation with rational coefficients one of whose root is $\frac{1}{1+\sqrt{2}}$ is
(A) $x^2-2x+1=0$ (B) $x^2+2x-1=0$
(C) $x^2-2x-1=0$ (D) none of these

18. If $x^2-5x+4>0$, then x lies in
(A) $(-\infty,1)\cup(4,\infty)$ (B) $[1,4]$ (C) $(1,4)$ (D) none of these

19. Let $\vec{a}=\hat{\imath}+\hat{\jmath}+p\hat{k}$ and $\vec{b}=\hat{\imath}+\hat{\jmath}+\hat{k}$. Then $|\vec{a}+\vec{b}|=|\vec{a}|+|\vec{b}|$, holds for
(A) all real p (B) no real p (C) $p=-1$ (D) $p=1$

20. Let the vectors $\vec{a}$ and $\vec{b}$ be such that $|\vec{a}|=3$ and $|\vec{b}|=\frac{\sqrt{2}}{3}$, then $\vec{a}\times\vec{b}$ is a unit vector, if the angle between $\vec{a}$ and $\vec{b}$ is
(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

21. The binary equivalent of 16 is
(A) 11100 (B) 10100 (C) 11010 (D) 10000

22. If $3,3,\sqrt{3}$ are the sides of a triangle, then angles of the triangle are
(A) $\frac{\pi}{4},\frac{\pi}{4},\frac{\pi}{2}$ (B) $\frac{2\pi}{9},\frac{2\pi}{9},\frac{5\pi}{9}$ (C) $\frac{\pi}{6},\frac{\pi}{6},\frac{2\pi}{3}$ (D) none of these

23. $cos^{-1}\frac{1}{2}+2sin^{-1}\frac{1}{2}$ is equal to
(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{3}$ (D) $\frac{2\pi}{3}$

24. The equation $\sin x+\cos x=1$ has
(A) infinite number of solutions (B) two solutions
(C) only one solution (D) no solution

25. Domain of $tan\,x$ is
(A) $\mathbb{R}$ (B) $x\in\mathbb{R}, and\ x\neq\left(n+\frac{1}{2}\right)\pi, n\in I$

(C) $x \in \mathbb{R},\ x \neq n\pi, n \in I$ (D) none of these

26. If the matrix product of two (3×3) matrix $AB = 0$, then
(A) $A = 0\ or\ B = 0$ (B) $A = 0\ and\ B = 0$
(C) it is not necessary that either $A = 0\ or\ B = 0$ (D) all statements are wrong

27. The system of linear equations :
$x + y + z = 0, 2x + y - z = 0, 3x + 2y + z = 0$ has
(A) no solution (B) a unique solutions
(C) an infinitely many solutions (D) none of these

28. If the value of a third order determinant is 7 then the value of the determinant formed by its cofactors is
(A) 49 (B) 7 (C) 7^3 (D) 7^4

29. The value of the determinant $\begin{vmatrix} 0 & a-b & a-c \\ b-a & 0 & b-c \\ c-a & c-b & 0 \end{vmatrix}$ is
(A) $a + b + c$ (B) $ab + bc + ca$ (C) abc (D) 0

30. If the value of mode and mean is 30 and 33 respectively, then the valued of median is
(A) 30 (B) 32 (C) 34 (D) none of these

31. In a family, there are 6 men, 4 women and 5 children whose ages separately are respectively 30, 25 and 5 years. Then mean age of the family is
(A) $20\frac{1}{3}$ (B) $18\frac{1}{3}$ (C) $21\frac{1}{3}$ (D) none of these

32. A room has 3 lamps. From a collection of 8 light bulbs of which 5 are not good, any person selects 3 at random and puts them in the socket, then the probability that he will have light, is
(A) $\frac{13}{28}$ (B) $\frac{5}{28}$ (C) $\frac{23}{28}$ (D) none of these

33. 5 boys and 5 girls sit in a row randomly. The probability that all 5 girls sit together is
(A) $\frac{1}{2}$ (B) $\frac{1}{42}$ (C) $\frac{1}{21}$ (D) none of these

34. The points $(3, 3), (h, 0)$ and $(0, k)$ are collinear if
(A) $\frac{1}{h} + \frac{1}{k} = \frac{1}{3}$ (B) $\frac{1}{h} - \frac{1}{k} = \frac{1}{3}$ (C) $\frac{1}{k} - \frac{1}{h} = 3$ (D) none of these

35. The equation $\sqrt{(x-2)^2 + y^2} + \sqrt{(x+2)^2 + y^2} = 4$ represents
(A) a parabola (B) a hyperbola (C) a circle (D) a pair of lines

36. The circle $x^2 + y^2 - 8x + 4y + 4 = 0$ touches
(A) x-axis (B) both axes (C) y-axis (D) neither x-axis nor y-axis

37. The value of α for which the line $x + y + 2 = 0$ touches the parabola $y^2 = \alpha x$ is
(A) -8 (B) -4 (C) 4 (D) 8

38. If the latus rectum of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, is equal to half of its minor axis, then the eccentricity of the ellipse is

(A) $\frac{1}{\sqrt{2}}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) none of these

39. If the line $2x+\sqrt{6}y=2$ is a tangent to the curve $x^2-2y^2=4$. Then the point of contact is

(A) $(\sqrt{6},\ 1)$ (B) $(7,-2\sqrt{6})$ (C) $(2,\ 3)$ (D) $(4,-\sqrt{6})$

40. The projection of the line segment joining the points $(-1,0,3)$ and $(2,5,1)$ on the line whose direction of ratios are 6,2,3 is

(A) $\frac{15}{7}$ (B) $\frac{9}{7}$ (C) $\frac{22}{7}$ (D) $\frac{13}{7}$

41. The co-ordinate of the point of intersection of the line $\frac{x+1}{1}=\frac{y+3}{2}=\frac{z-2}{-2}$ with the plane $x+2y+3z=5$ is

(A) $(0,1,1)$ (B) $(-7,\ -15,14)$ (C) $(2,0,1)$ (D) $(-8,5,1)$

42. The perpendicular distance of the point $(1,2,3)$ from the line $\frac{x-6}{3}=\frac{y-7}{2}=\frac{z-7}{-2}$ is

(A) 7 (B) 5 (C) 4 (D) 8

43. The shortest distance of the point $(1,2,\ -1)$ to the surface of the sphere $x^2+y^2+z^2=54$ is

(A) $3\sqrt{6}$ (B) $2\sqrt{6}$ (C) $\sqrt{6}$ (D) 2

44. The order of the differential equation $\frac{d^3y}{dx^3}+x\left(\frac{dy}{dx}\right)^4=4\ln x$ is

(A) 1 (B) 4 (C) 3 (D) none of these

45. The general solution of $\frac{d^2y}{dx^2}=e^{-x}$ is

(A) $e^{-x}+cx+d$ (B) e^{-x} (C) $e^{-x}+cx^2+d$ (D) none of these

46. The solution of $\frac{dy}{dx}=3^{y-x}$ is

(A) $3^x+3^y=k$ (B) $3^x-3^{y+1}=k$

(C) $\frac{1}{3^x}+\frac{1}{3^y}=k$ (D) $\frac{1}{3^x}-\frac{1}{3^y}=k$

47. The slope of the normal to the curve $y=3e^{x^2}+4\sin x$ at $x=0$ is

(A) 4 (B) $\frac{1}{4}$ (C) -4 (D) $-\frac{1}{4}$

48. If $z=sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then $x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}$ is equal to

(A) 0 (B) z (C) $\sin z$ (D) $\tan z$

49. $\frac{d^8}{dx^8}\sin(2x+3)$ is equal to

(A) $2^8 \cos(2x + 3)$ (B) $2^8 \sin(2x + 3)$
(C) $2^7 \cos(2x + 3)$ (D) $2^7 \sin(2x + 3)$

50. $\lim_{x\to 0} \frac{\cos 2x - \cos 5x}{1 - \cos 3x}$ is equal to
(A) $\frac{7}{3}$ (B) $\frac{3}{7}$ (C) $\frac{2}{5}$ (D) 0

51. The function $f(x) = \begin{cases} \frac{\sin x}{x} & , x \neq 0 \\ a & , x = 0 \end{cases}$ is continuous at $x = 0$ if a is
(A) 0 (B) -1 (C) 1 (D) none of these

52. The derivative of $|x - 3|$ at $x = 2$ is
(A) -1 (B) 0 (C) 1 (D) not defined

53. Derivative of $\sin 2x$ w.r.t. $\cos 2x$
(A) $2 \tan 2x$ (B) $-\cot 2x$ (C) $2 \cot 2x$ (D) $-\tan 2x$

54. The interval in which $y = x^2 e^{-x}$ is increasing is
(A) $(-\infty, \infty)$ (B) $(-2,0)$ (C) $(2, \infty)$ (D) $(0,2)$

55. $\frac{d}{dx} \ln|\sec x + \tan x|$ is
(A) $\sec x$ (B) $\tan x$ (C) $\sec x + \tan x$ (D) $\sec x - \tan x$

56. Area bounded by the curve $y = x^2$ and the line $y = 1$ is
(A) 1 (B) $\frac{3}{4}$ (C) $\frac{4}{3}$ (D) $\frac{16}{3}$

57. $\int_{-2}^{2} (\alpha x^3 + \beta x) dx = 0$ for
(A) $\alpha > 0$ and $\beta > 0$ (B) for any value of α, β
(C) $\alpha > 0$ and $\beta < 0$ (D) $\alpha < 0$ and $\beta < 0$ only

58. $\int \frac{\tan(\ln x)}{x} dx$ is equal to
(A) $ln|\sec(\ln x)| + C$ (B) $ln|\cos(\ln x)| + C$
(C) $ln|\sin(\ln x)| + C$ (D) none of these

59. $\int \frac{(1+x+x^2)}{1+x^2} e^{\tan^{-1}x} dx$ is equal to
(A) $x^2 e^{\tan^{-1}x} + C$ (B) $e^{\tan^{-1}x} + C$
(C) $x e^{\tan^{-1}x} + C$ (D) none of these

60. If $f(x) = \int_0^x t^2 \sin t \, dt$, then $f'(x)$ is
(A) $2x \sin x + cos^2 x$ (B) $x^2 \sin x + 2x \cos x$
(C) $x^2 \cos x$ (D) $x^2 \sin x$

Solution Keys

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