

CBSE Class 12 Mathematics

Model Question Paper

(SET – 4)

Time: 3 Hours | Maximum Marks: 80

Section A (1×20 = 20 Marks) – MCQs

1. If $|A| = -2$ for a 3×3 matrix A , then $|\text{adj } A| =$
(a) 4 (b) -4 (c) 8 (d) -8
2. If $f(x) = x^x$, then $f'(x) =$
(a) $x^x \ln x$
(b) $x^x(1 + \ln x)$
(c) x^{x-1}
(d) $\ln x$
3. Order and degree of equation

$$\left(\frac{d^2y}{dx^2}\right)^2 + \frac{dy}{dx} + y = 0$$

are

- (a) 2,2
- (b) 2,1
- (c) 1,2
- (d) 2,4

4. If vectors a and b satisfy $|a \times b| = |a||b|$, then angle between them is
(a) 0°
(b) 45°
(c) 90°
(d) 180°
5. $\int_0^\pi \sin x dx =$
(a) 0
(b) 1
(c) 2
(d) π

6. If $P(A)=1/3$, $P(B)=1/4$ and A,B independent, then $P(A \cup B)=$

- (a) $7/12$
- (b) $1/12$
- (c) $1/3$
- (d) $1/4$

7. $\lim_{x \rightarrow 0} \frac{e^x - 1}{x} =$

- (a) 0
- (b) 1
- (c) e
- (d) ∞

8. If A is orthogonal matrix, then $|A| =$

- (a) 0
- (b) 1
- (c) ± 1
- (d) 2

9. Direction cosines of vector $2i+2j+1k$ are

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

10. If random variable X has $E(X)=5$, then $E(2X+3)=$

- (a) 10
- (b) 13
- (c) 7
- (d) 5

11. Derivative of $\tan^{-1}x$ is

- (a) $1/(1+x^2)$
- (b) $1/(1-x^2)$
- (c) \sec^2x
- (d) $1/x$

12. $\int x e^{x^2} dx =$

- (a) $e^{x^2} + C$
- (b) $e^{x^2}/2 + C$
- (c) $2e^{x^2} + C$
- (d) $\ln x$

13. If A and B are mutually exclusive, then

$P(A|B)=$

- (a) 1
- (b) 0
- (c) P(A)
- (d) P(B)

14. Distance of point (1,2,2) from plane $x+2y+2z=9$ is

- (a) 2
- (b) 3
- (c) 1
- (d) 4

15. If $X \sim \text{Bin}(4, 1/2)$, then mean is

- (a) 1
- (b) 2
- (c) 4
- (d) 1/2

16. If A is singular matrix, then $|A| =$

- (a) 1
- (b) 0
- (c) -1
- (d) 2

17. If $dy/dx = y$, then solution is

- (a) $y = Ce^x$
- (b) $y = x^2$
- (c) $y = Cx$
- (d) $y = C$

18. If $a=(1,2,3)$, $b=(4,5,6)$, then $a \cdot b =$

- (a) 32
- (b) 21
- (c) 15
- (d) 12

19. $\int_0^1 e^x dx =$

- (a) e
- (b) e-1
- (c) 1
- (d) 0

20. Rank of 3×3 identity matrix is

- (a) 0
- (b) 1

(c) 2

(d) 3

Section B (2×6 = 12 Marks)

21. Find adjoint of matrix

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

22. Differentiate $y = x^x$

23. Find equation of tangent to curve $y = x^3 - 3x$ at $x=1$.

24. Evaluate $\int \frac{x}{1+x^2} dx$

25. Find angle between vectors $i+j+k$ and $2i-j+k$.

26. Two cards are drawn from 52 cards. Find probability both are kings.

Section C (3×8 = 24 Marks)

27. Using determinants, solve:

$$\begin{matrix} x + y + z = 6 \\ 2x + y + z = 9 \\ x + 2y + z = 8 \end{matrix}$$

28. Find dy/dx if $\sin(x + y) = x$

29. Evaluate $\int_0^1 x e^x dx$

30. Show that points (1,2,3), (2,4,6), (3,6,9) are collinear.

31. A fair die is thrown thrice. Find probability of getting exactly two 6's.

32. Solve differential equation:

$$\frac{dy}{dx} + 2y = 0$$

33. Find area bounded by curve $y=4-x^2$ and x-axis.

34. Find equation of sphere passing through (1,0,0), (0,1,0), (0,0,1) and origin.

Section D (4×6 = 24 Marks)

35. If

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 6 \end{bmatrix}$$

show that A is invertible and find A^{-1} .

36. Verify Lagrange's Mean Value Theorem for $f(x)=\ln x$ on $[1,e]$.

37. Evaluate $\int x^2 \ln x dx$

38. Find shortest distance between lines:

$$\frac{x-1}{1} = \frac{y-2}{-1} = \frac{z}{2}$$

and

$$\frac{x}{2} = \frac{y-1}{1} = \frac{z+1}{-1}$$

39. Find mean and variance of Binomial distribution $n=3$, $p=1/2$.

40. Solve differential equation:

$$(x+y)dx + (x-y)dy = 0$$