CBSE Class 12 Mathematics

Model Question Paper

(SET – 5)

Time: 3 Hours | Maximum Marks: 80

Section A (1×20 = 20 Marks) – MCQs

1. If A is a 3×3 matrix and |A| = 2, then |5A| =
   (a) 10 (b) 50 (c) 250 (d) 125

2. If $f(x) = \ln(x^2 + 1)$, then f'(x) =
   (a) $\frac{2x}{x^2+1}$
   (b) $\frac{x}{x^2+1}$
   (c) $2x\ln(x^2 + 1)$
   (d) $\frac{1}{x^2+1}$

3. Order of differential equation

$$\left(\frac{d^3y}{dx^3}\right) + \left(\frac{dy}{dx}\right)^2 = 0$$

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

4. If |a×b| = 0, then vectors are
   (a) Perpendicular
   (b) Parallel
   (c) Equal
   (d) Unit vectors

5. $\int_0^2 2x\,dx =$
   (a) 2 (b) 4 (c) 8 (d) 6

6. If P(A)=0.5, P(B)=0.4 and P(A∩B)=0.2, then P(A∪B)=
   (a) 0.7 (b) 0.9 (c) 0.6 (d) 0.2

7. $\lim_{x \to 0} \frac{\sin 3x}{x} =$
   (a) 0
   (b) 1

(c) 3

(d) ∞

8. Determinant of diagonal matrix is

   (a) Sum of diagonal elements

   (b) Product of diagonal elements

   (c) 0

   (d) 1

9. Equation of plane passing through (1,1,1) and normal to (1,1,1) is

   (a) x+y+z=3

   (b) x+y+z=1

   (c) x+y+z=0

   (d) x−y+z=1

10. If E(X)=2 and Var(X)=3, then E(X^2)=

    (a) 7

    (b) 5

    (c) 1

    (d) 3

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

    (a) $\dfrac{1}{\sqrt{1-x^2}}$

    (b) $\dfrac{-1}{\sqrt{1-x^2}}$

    (c) cos x

    (d) sec x

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

    (a) e^{2x}

    (b) e^{2x}/2 + C

    (c) 2e^{2x}

    (d) ln x

13. If events A and B are independent, then

    (a) P(A∩B)=P(A)+P(B)

    (b) P(A∩B)=P(A)P(B)

    (c) P(A∪B)=0

    (d) P(A)=P(B)

14. Distance between points (2,1,3) and (4,5,3) is

    (a) 4

    (b) $\sqrt{20}$

    (c) 5

    (d) $\sqrt{16}$

15. If X~Bin(5,1/2), then variance is
    (a) 5/4
    (b) 5/2
    (c) 2
    (d) 1

16. If A is identity matrix, then A^{-1} =
    (a) 0
    (b) I
    (c) –I
    (d) None

17. If dy/dx = 2y, then solution is
    (a) y = Ce^{2x}
    (b) y = 2e^x
    (c) y = x^2
    (d) y = Cx

18. If a=(2,0,0), b=(0,3,0), then |a×b| =
    (a) 6
    (b) 5
    (c) 1
    (d) 0

19. $\int \frac{dx}{\sqrt{1-x^2}} =$
    (a) $\sin^{-1}x$ + C
    (b) $\cos^{-1}x$
    (c) $\tan^{-1}x$
    (d) sec x

20. Rank of zero matrix is
    (a) 1
    (b) 2
    (c) 0
    (d) 3

Section B (2×6 = 12 Marks)

21. Find determinant of matrix

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

22. Differentiate $y = x^3 e^x$

23. Find equation of normal to curve y = x² at x=2.

24. Evaluate $\int (3x^2 + 2x)dx$

25. Find unit vector in direction of vector i+2j+2k.

26. A card is drawn from pack of 52 cards. Find probability of getting a red card.

Section C (3×8 = 24 Marks)

27. Using determinants, solve:

$$x + y = 5 \quad 2x + 3y = 11$$

28. Find dy/dx if x² + y² = 10.

29. Evaluate $\int_0^2 (x^2 + 1)dx$

30. Show that vectors (1,1,1), (2,2,2) are parallel.

31. A fair coin is tossed three times. Find probability of exactly two heads.

32. Solve differential equation:

$$\frac{dy}{dx} = 3x^2$$

33. Find area bounded by curve y=x² and line x=2.

34. Find equation of plane passing through (1,2,3) and parallel to plane 2x−y+z=5.

Section D (4×6 = 24 Marks)

35. If

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

find |A| and A⁻¹.

36. Verify Rolle's Theorem for f(x)=x³−x on [−1,1].

37. Evaluate $\int x^2 \sin x\, dx$

38. Find shortest distance between skew lines:

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

and

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

39. Find mean and variance of Binomial distribution n=4, p=1/3.

40. Solve differential equation:

$$\frac{dy}{dx} - y = e^x$$