CBSE Class 12 Mathematics

(SET–4) Answers key

Section A – MCQ Answers

1. 4
2. $x^x(1 + \ln\ x)$
3. 2,2
4. 90°
5. 2
6. 1/2
7. 1
8. ±1
9. (2/3, 2/3, 1/3)
10. 13
11. $1/(1+x^2)$
12. $e^{x^2}/2 + C$
13. 0
14. 1
15. 2
16. 0
17. $y = Ce^x$
18. 32
19. $e - 1$
20. 3

Section B

21. Adjoint

$$adj(A) = \begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$$

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22. Differentiation

$$y = x^x$$
$$\ln\ y = x\ln\ x$$
$$\frac{1}{y}\frac{dy}{dx} = \ln\ x + 1$$
$$\frac{dy}{dx} = x^x(1 + \ln\ x)$$

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23. Tangent Equation

$$y = x^3 - 3x$$
$$dy/dx = 3x^2 - 3$$

At x=1 → slope = 0

Point (1,-2)

$$y = -2$$

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24. Integration

$$\int \frac{x}{1+x^2}\,dx$$

Let $t = 1 + x^2$

$$= \frac{1}{2}\ln\,(1 + x^2) + C$$

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25. Angle Between Vectors

a=(1,1,1)
b=(2,-1,1)

$$a \cdot b = 2 - 1 + 1 = 2$$

|a|=√3
|b|=√6

$$\cos\ \theta = \frac{2}{\sqrt{18}} = \frac{2}{3\sqrt{2}}$$
$$\theta = \cos^{-1}\left(\frac{2}{3\sqrt{2}}\right)$$

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26. Probability (Two Kings)

$$= \frac{4C2}{52C2}$$
$$= \frac{6}{1326} = \frac{1}{221}$$

Section C

27. Solution

x=2
y=1
z=3

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28. Differentiation

$$\sin\,(x + y) = x$$

Differentiate:

$$\cos\,(x + y)(1 + dy/dx) = 1$$
$$dy/dx = \frac{1}{\cos\,(x + y)} - 1$$

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29. Definite Integral

$$\int_0^1 x\, e^x dx$$
$$= 1$$

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30. Collinear

Each point multiple of (1,2,3)

Hence collinear.

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31. Exactly Two 6's (3 throws)

$$= 3C2(1/6)^2(5/6)$$
$$= 15/216 = 5/72$$

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32. Differential Equation

$$dy/dx + 2y = 0$$
$$y = Ce^{-2x}$$

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33. Area

$$4 - x^2 = 0$$

x=±2

$$\int_{-2}^{2} (4 - x^2) dx$$
$$= 32/3$$

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34. Sphere Equation

$$x^2 + y^2 + z^2 - x - y - z = 0$$

Section D

35. Determinant

$$| A |= 1$$

Since non-zero → invertible

$$A^{-1} = adj(A)$$

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36. Lagrange MVT

$$\frac{\ln\ e - \ln\ 1}{e - 1} = \frac{1}{e - 1}$$
$$f'(x) = 1/x$$
$$1/c = 1/(e - 1)$$
$$c = e - 1$$

Verified.

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37. Integration by Parts

$$\int x^2 \ln\ x dx$$
$$= \frac{x^3}{3} \ln\ x - \frac{x^3}{9} + C$$

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38. Shortest Distance

Using formula:

$$SD = \frac{| (a_2 - a_1) \cdot (b_1 \times b_2) |}{| b_1 \times b_2 |}$$

(Final value after solving = $2\sqrt{3}$)

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39. Binomial (n=3, p=1/2)

Mean:

$$np = 3/2$$

Variance:

$$npq = 3/4$$

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40. Differential Equation

$$(x + y)dx + (x - y)dy = 0$$
$$x^2 - y^2 = C$$