

JK Board Class 12 Mathematics 2026 Question Paper

Time Allowed :3 Hours	Maximum Marks :80	Total Questions :31
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General Instructions

1. This question paper is divided into 4 sections: **Section A, B, C and D.**
2. There are a total of **31** questions.
3. **Section A** contains **Multiple Choice Questions (MCQs)** carry **1** marks each.
4. **Section B** contains **Very Short Answer Type Questions (VSAs)** carry **2** marks each.
5. **Section C** contains **Short Answer Type Questions (SAs)** carry **4** marks each.
6. **Section D** contains **Long Answer Type Questions (LAs)** carry **6** marks each.

Section A

(Objective Type/Multiple Type Questions)

1. If the matrix **A** is both symmetric and skew-symmetric, then

- (a) **A** is a diagonal matrix
- (b) **A** is a zero matrix
- (c) **A** is a square matrix
- (d) None of these

2. If **A** is a square matrix of order **n**, then $|\text{adj}A|$ is equal to:

- (a) $|A|$
- (b) $|A|^n$
- (c) $|A|^{n-1}$
- (d) None of these

3. The integrating factor of the differential equation $x \frac{dy}{dx} - y = 2x^2$ is:

- (a) e^{-x}
- (b) e^{-y}
- (c) $\frac{1}{x}$
- (d) x

4. The identity function on real numbers given by $f(x) = x$ is continuous at every real number. (Write True or False).

5. The anti derivative of $\sin 2x$ is:

- (a) $\cos 2x + c$
 - (b) $-\frac{\sin 2x}{2} + c$
 - (c) $-\frac{\cos 2x}{2} + c$
 - (d) None of these
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7. The function given by $f(x) = \cos x$ is decreasing in $(0, \pi)$. (Write True or False).

8. The vector joining the points $P(2, 3, 0)$ and $Q(-1, -2, -4)$ directed from P to Q is

9. Define Skew lines in space.

10. Define optimization Problem.

Section B

(Very Short Answer Type Questions)

11. Determine whether the following relation is reflexive, symmetric and transitive: Relation R in the set N of natural numbers defined by $R = \{(x, y) : y = x + 5 \text{ and } x < 4\}$

- (A) Reflexive, but not symmetric or transitive
 - (B) Symmetric, but not reflexive or transitive
 - (C) Transitive, but not reflexive or symmetric
 - (D) Neither reflexive, nor symmetric, nor transitive
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12. Find the principal value of $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$

13. Show that the function given by $f(x) = 7x - 3$ is increasing on \mathbb{R} .

14. Find the unit vector in the direction of vector $\vec{a} = 2\hat{i} + 3\hat{j} + \hat{k}$

15. Find $|\vec{a} \times \vec{b}|$, if $\vec{a} = \hat{i} - 7\hat{j} + 7\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 2\hat{k}$

16. Evaluate $\int \frac{(\log x)^2}{x} dx$

17. Evaluate $\int_2^3 \frac{1}{x} dx$

18. If $P(A) = \frac{7}{13}$, $P(B) = \frac{9}{13}$ and $P(A \cap B) = \frac{4}{13}$, then evaluate $P(A/B)$.

19. If $2P(A) = P(B) = \frac{5}{13}$ and $P(A/B) = \frac{2}{5}$, then evaluate $P(A \cup B)$.

20. Construct a 3×4 matrix, whose elements are given by $a_{ij} = |2i - j|$.

Section C

(Short Answer Type Questions)

21. Find the general solution of the differential equation $(e^x + e^{-x})dy - (e^x - e^{-x})dx = 0$.

22. Find the area of the region bounded by the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$.

23. Find the value of K so that the given function is continuous at the indicated point:

$$f(x) = \begin{cases} \frac{K \cos x}{\pi - 2x}, & \text{if } x \neq \frac{\pi}{2} \\ 3, & \text{if } x = \frac{\pi}{2} \end{cases} \text{ at } x = \frac{\pi}{2}$$

24. Find the shortest distance between the lines $\vec{r} = (\hat{i} + 2\hat{j} + \hat{k}) + \lambda(\hat{i} - \hat{j} + \hat{k})$ and $\vec{r} = (2\hat{i} - \hat{j} - \hat{k}) + \mu(2\hat{i} + \hat{j} + 2\hat{k})$.

25. If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to \vec{c} , then find the value of λ .

26. Solve the following linear programming problem graphically:

Maximize $Z = 3x + 2y$ subject to constraints:

$$x + 2y \leq 10, 3x + y \leq 15, x \geq 0, y \geq 0.$$

27. Express in the simplest form: $\tan^{-1} \left(\frac{\cos x - \sin x}{\cos x + \sin x} \right)$, $-\frac{\pi}{4} < x < \frac{3\pi}{4}$

28. A bag contains 4 red and 4 black balls; another bag contains 2 red and 6 black balls. One of the two bags is selected at random and a ball is drawn from the bag which is found to be red. Find the probability that the ball is drawn from the first bag.

Section D

(Long Answer Type Questions)

29(a). If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find K so that $A^2 = KA - 2I$.

29(b). Solve the following system of equations by matrix method:

$$2x + 3y + 3z = 5,$$

$$x - 2y + z = -4,$$

$$3x - y - 2z = 3.$$

30(a). Find $\int \frac{x}{(x-1)(x-2)(x-3)} dx$.

30(b). Find $\int \sqrt{x^2 + 2x + 5} dx$.

31(a). Find $\frac{dy}{dx}$, if $x = a(\cos \theta + \theta \sin \theta)$ and $y = a(\sin \theta - \theta \cos \theta)$.

31(b). If $y = \sin^{-1} x$, Show that $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} = 0$.
