

JEE Main April 2025
Question Paper With Text Solution
04 April | Shift-1

MATHEMATICS



JEE Main & Advanced | XI-XII Foundation | VI-X Pre-Foundation

Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911

Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in

**JEE MAIN APRIL 2025 | 04TH APRIL SHIFT-1****SECTION – A**

Question ID : 347577156

1. In the expansion of $\left(\sqrt[3]{2} + \frac{1}{\sqrt[3]{3}}\right)^n$, $n \in \mathbb{N}$, if the ratio of 15th term from the beginning to the 15th term from the end is $\frac{1}{6}$, then the value of nC_3 is :

- (1) 4060 (2) 1040 (3) 4960 (4) 2300

Ans. Official answer NTA(4)**Sol.**

Question ID : 347577168

2. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function satisfying $f(0) = 1$ and $f(2x) - f(x) = x$ for all $x \in \mathbb{R}$. If

$$\lim_{n \rightarrow \infty} \left\{ f(x) - f\left(\frac{x}{2^n}\right) \right\} = G(x), \text{ then } \sum_{r=1}^{10} G(r^2) \text{ is equal to :}$$

- (1) 215 (2) 385 (3) 420 (4) 540

Ans. Official answer NTA(2)**Sol.**

Question ID : 347577166

3. Consider two vectors

$$\vec{u} = 3\hat{i} - \hat{j} \text{ and } \vec{v} = 2\hat{i} + \hat{j} - \lambda\hat{k}, \lambda > 0. \text{ The angle between them is given by } \cos^{-1}\left(\frac{\sqrt{5}}{2\sqrt{7}}\right).$$

Let $\vec{v} = \vec{v}_1 + \vec{v}_2$, where $\vec{v}_1$ is parallel to $\vec{u}$ and $\vec{v}_2$ is perpendicular to $\vec{u}$. Then the value $|\vec{v}_1|^2 + |\vec{v}_2|^2$ is equal to :

- (1) 14 (2) $\frac{25}{2}$ (3) $\frac{23}{2}$ (4) 10

Ans. Official answer NTA(1)

Sol.

Question ID : 347577161

4. The length of the latus-rectum of the ellipse, whose foci are $(2, 5)$ and $(2, -3)$ and eccentricity is $\frac{4}{5}$, is :

- (1) $\frac{50}{3}$ (2) $\frac{6}{5}$ (3) $\frac{10}{3}$ (4) $\frac{18}{5}$

Ans. Official answer NTA(4)**Sol.**

Question ID : 347577160

5. Let the three sides of a triangle are on the lines $4x - 7y + 10 = 0$, $x + y = 5$ and $7x + 4y = 15$. Then the distance of its orthocentre from the orthocentre of the triangle formed by the lines $x = 0$, $y = 0$ and $x + y = 1$ is :

- (1) $\sqrt{5}$ (2) 5 (3) $\sqrt{20}$ (4) 20

Ans. Official answer NTA(1)**Sol.**

Question ID : 347577159

6. A box contains 10 pens of which 3 are defective. A sample of 2 pens is drawn at random and let X denote the number of defective pens. Then the variance of X is :

- (1) $\frac{28}{75}$ (2) $\frac{2}{15}$ (3) $\frac{3}{5}$ (4) $\frac{11}{15}$

Ans. Official answer NTA(1)**Sol.**

Question ID : 347577169

7. The value of $\int_{-1}^1 \frac{(1 + \sqrt{|x| - x})e^x + (\sqrt{|x| - x})e^{-x}}{e^x + e^{-x}} dx$ is equal to :

- (1) $2 + \frac{2\sqrt{2}}{3}$ (2) $3 - \frac{2\sqrt{2}}{3}$ (3) $1 - \frac{2\sqrt{2}}{3}$ (4) $1 + \frac{2\sqrt{2}}{3}$

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Ans. Official answer NTA (4)**Sol.**

Question ID : 347577165

8. Let A and B be two distinct points on the line $L : \frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$. Both A and B are at a distance $2\sqrt{17}$ from the foot of perpendicular drawn from the point (1, 2, 3) on the line L. If O is the origin, then $\overrightarrow{OA} \cdot \overrightarrow{OB}$ is equal to :

- (1) 62 (2) 21 (3) 49 (4) 47

Ans. Official answer NTA (4)**Sol.**

Question ID : 347577152

9. Let $f, g : (1, \infty) \rightarrow \mathbb{R}$ be defined as $f(x) = \frac{2x+3}{5x+2}$ and $g(x) = \frac{2-3x}{1-x}$. If the range of the function $f \circ g : [2, 4] \rightarrow \mathbb{R}$ is $[\alpha, \beta]$, then $\frac{1}{\beta-\alpha}$ is equal to :

- (1) 29 (2) 2 (3) 56 (4) 68

Ans. Official answer NTA (3)**Sol.**

Question ID : 347577170

10. Let $f : [0, \infty) \rightarrow \mathbb{R}$ be a differentiable function such that $f(x) = 1 - 2x + \int_0^x e^{x-t} f(t) dt$ for all $x \in [0, \infty)$.

Then the area of the region bounded by $y = f(x)$ and the coordinate axes is :

- (1) $\sqrt{2}$ (2) 2 (3) $\sqrt{5}$ (4) $\frac{1}{2}$

Ans. Official answer NTA (4)**Sol.**



Question ID : 347577162

11. If $10 \sin^4 \theta + 15 \cos^4 \theta = 6$, then the value of $\frac{27 \operatorname{cosec}^6 \theta + 8 \sec^6 \theta}{16 \sec^8 \theta}$ is :

(1) $\frac{3}{4}$

(2) $\frac{2}{5}$

(3) $\frac{1}{5}$

(4) $\frac{3}{5}$

Ans. Official answer NTA(2)**Sol.**

Question ID : 347577155

12. $1 + 3 + 5^2 + 7 + 9^2 + \dots$ upto 40 terms is equal to :

(1) 33980

(2) 41880

(3) 43890

(4) 40870

Ans. Official answer NTA(2)**Sol.**

Question ID : 347577163

13. Considering the principal values of the inverse trigonometric functions,

$$\sin^{-1} \left(\frac{\sqrt{3}}{2}x + \frac{1}{2}\sqrt{1-x^2} \right), -\frac{1}{2} < x < \frac{1}{\sqrt{2}}, \text{ is equal to :}$$

(1) $\frac{5\pi}{6} - \sin^{-1} x$

(2) $\frac{\pi}{4} + \sin^{-1} x$

(3) $\frac{-5\pi}{6} - \sin^{-1} x$

(4) $\frac{\pi}{6} + \sin^{-1} x$

Ans. Official answer NTA(4)**Sol.**

Question ID : 347577167

14. If $\lim_{x \rightarrow 1^+} \frac{(x-1)(6 + \lambda \cos(x-1)) + \mu \sin(1-x)}{(x-1)^3} = -1$, where $\lambda, \mu \in \mathbb{R}$, then $\lambda + \mu$ is equal to :

(1) 19

(2) 17

(3) 18

(4) 20

Ans. Official answer NTA(3)**Sol.****MATRIX JEE ACADEMY**

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Question ID : 347577157

15. For an integer $n \geq 2$, if the arithmetic mean of all coefficients in the binomial expansion of $(x + y)^{2n-3}$ is 16, then the distance of the point $P(2n-1, n^2-4n)$ from the line $x + y = 8$ is :

- (1) $\sqrt{2}$ (2) $3\sqrt{2}$ (3) $2\sqrt{2}$ (4) $5\sqrt{2}$

Ans. Official answer NTA(2)

Sol.

Question ID : 347577158

16. The probability, of forming a 12 persons committee from 4 engineers, 2 doctors and 10 professors containing at least 3 engineers and at least 1 doctor, is :

- (1) $\frac{103}{182}$ (2) $\frac{17}{26}$ (3) $\frac{19}{26}$ (4) $\frac{129}{182}$

Ans. Official answer NTA(4)

Sol.

Question ID : 347577154

17. Let $A = \{1, 6, 11, 16, \dots\}$ and $B = \{9, 16, 23, 30, \dots\}$ be the sets consisting of the first 2025 terms of two arithmetic progressions. Then $n(A \cup B)$ is :

- (1) 3761 (2) 4027 (3) 4003 (4) 3814

Ans. Official answer NTA(1)

Sol.

Question ID : 347577151

18. Consider the sets $A = \{(x, y) \in \mathbb{R} \times \mathbb{R} : x^2 + y^2 = 25\}$, $B = \{(x, y) \in \mathbb{R} \times \mathbb{R} : x^2 + 9y^2 = 144\}$, $C = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : x^2 + y^2 \leq 4\}$ and $D = A \cap B$. The total number of one-one functions from the set D to the set C is :

- (1) 15120 (2) 19320 (3) 18290 (4) 17160

Ans. Official answer NTA(4)

Sol.



Question ID : 347577153

19. Consider the equation $x^2 + 4x - n = 0$, where $n \in [20, 100]$ is a natural number. Then the number of all distinct values of n , for which the given equation has integral roots, is equal to :

(1) 6 (2) 8 (3) 5 (4) 7

Ans. Official answer NTA(1)

Sol.

Question ID : 347577164

20. Let the shortest distance between the lines $\frac{x-3}{3} = \frac{y-\alpha}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-\beta}{4}$ be $3\sqrt{30}$. Then the positive value of $5\alpha + \beta$ is :

(1) 42 (2) 46 (3) 48 (4) 40

Ans. Official answer NTA(2)

Sol.

SECTION - B

Question ID : 347577173

21. Let C be the circle $x^2 + (y-1)^2 = 2$, E_1 and E_2 be two ellipses whose centres lie at the origin and major axes lie on x -axis and y -axis respectively. Let the straight line $x + y = 3$ touch the curves C , E_1 and E_2 at $P(x_1, y_1)$, $Q(x_2, y_2)$ and $R(x_3, y_3)$ respectively. Given that P is the mid point of the line segment QR and $PQ = \frac{2\sqrt{2}}{3}$, the value of $9(x_1y_1 + x_2y_2 + x_3y_3)$ is equal to _____.

Ans. Official answer NTA(46)

Sol.

Question ID : 347577172

22. Let $A = \begin{bmatrix} \cos \theta & 0 & -\sin \theta \\ 0 & 1 & 0 \\ \sin \theta & 0 & \cos \theta \end{bmatrix}$. If for some $\theta \in (0, \pi)$, $A^2 = A^T$, then the sum of the diagonal elements of the matrix $(A + I)^3 + (A - I)^3 - 6A$ is equal to _____.

Ans. Official answer NTA(6)

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**Sol.**

Question ID : 347577171

23. $A = \{z \in \mathbb{C} : |z - 2 - i| = 3\}$, $B = \{z \in \mathbb{C} : \operatorname{Re}(z - iz) = 2\}$ and $S = A \cap B$. Then $\sum_{z \in S} |z|^2$ is equal to _____.

Ans. Official answer NTA (22)**Sol.**

Question ID : 347577175

24. If the area of the region $\{(x, y) : |x - 5| \leq y \leq 4\sqrt{x}\}$ is A, then 3A is equal to _____.

Ans. Official answer NTA (368)**Sol.**

Question ID : 347577174

25. Let m and n be the number of points at which the function $f(x) = \max \{x, x^3, x^5, \dots, x^{21}\}$, $x \in \mathbb{R}$, is not differentiable and not continuous, respectively. Then $m + n$ is equal to _____.

Ans. Official answer NTA (3)**Sol.**