JEE Main April 2025

Question Paper With Text Solution

08 April | Shift-2

MATHEMATICS

MATRIX

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

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JEE MAIN APRIL 2025 | 08TH APRIL SHIFT-2

SECTION – A

Question ID : 3475772491

1. Let $A=\begin{bmatrix}2 & 2+p & 2+p+q\\ 4 & 6+2p & 8+3p+2q\\ 6 & 12+3p & 20+6p+3q\end{bmatrix}$. If $\det(\text{adj}(\text{adj}(3A)))=2^m\cdot 3^n$, $m, n \in N$, then $m+n$ is equal to :

(1) 24 (2) 22 (3) 20 (4) 26

Ans. Official answer NTA (1)

Sol.

Question ID : 3475772505

2. Let f(x) be a positive function and $I_1=\int_{-\frac{1}{2}}^{1} 2xf\left(2x\left(1-2x\right)\right)dx$ and $I_2=\int_{-1}^{2} f\left(x\left(1-x\right)\right)dx$. Then the value of $\frac{I_2}{I_1}$ is equal to :

(1) 9 (2) 4 (3) 12 (4) 6

Ans. Official answer NTA (2)

Sol.

Question ID : 3475772501

3. Let $\vec{a}=\hat{i}+2\hat{j}+\hat{k}$ and $\vec{b}=2\hat{i}+\hat{j}-\hat{k}$. Let $\hat{c}$ be a unit vector in the plane of the vectors $\vec{a}$ and $\vec{b}$ and be perpendicular to $\vec{a}$. Then such a vector $\hat{c}$ is :

(1) $\frac{1}{\sqrt{2}}\left(-\hat{i}+\hat{k}\right)$ (2) $\frac{1}{\sqrt{3}}\left(\hat{i}-\hat{j}+\hat{k}\right)$ (3) $\frac{1}{\sqrt{5}}\left(\hat{j}-2\hat{k}\right)$ (4) $\frac{1}{\sqrt{3}}\left(-\hat{i}+\hat{j}-\hat{k}\right)$

Ans. Official answer NTA (1)

Sol.

Question ID : 3475772498

4. Let a be the length of a side of a square OABC with O being the origin. Its side OA makes an acute angle α with the positive x-axis and the equations of its diagonals are $\left(\sqrt{3}+1\right)x+\left(\sqrt{3}-1\right)y=0$ and $\left(\sqrt{3}-1\right)x-\left(\sqrt{3}+1\right)y+8\sqrt{3}=0$. Then a^2 is equal to :

(1) 16 (2) 24 (3) 48 (4) 32

Ans. Official answer NTA (3)

Sol.

Question ID : 3475772496

5. If A and B are two events such that P(A) = 0.7, P(B) = 0.4 and $P\left(A\cap\overline{B}\right)=0.5$, where $\overline{B}$ denotes the complement of B, then $P\left(B\middle|\left(A\cup\overline{B}\right)\right)$ is equal to :

(1) $\frac{1}{6}$ (2) $\frac{1}{2}$ (3) $\frac{1}{4}$ (4) $\frac{1}{3}$

Ans. Official answer NTA (3)

Sol.

Question ID : 3475772489

6. The sum of the squares of the roots of $|x-2|^2+|x-2|-2=0$ and the squares of the roots of $x^2-2|x-3|-5=0$, is :

(1) 30 (2) 24 (3) 26 (4) 36

Ans. Official answer NTA (4)

Sol.

Question ID : 3475772492

7. Let α be a solution of $x^2 + x + 1 = 0$, and for some a and b in R, $\begin{bmatrix}4 & a & b\end{bmatrix}\begin{bmatrix}1 & 16 & 13\\ -1 & -1 & 2\\ -2 & -14 & -8\end{bmatrix} = \begin{bmatrix}0 & 0 & 0\end{bmatrix}$.

If $\frac{4}{\alpha^4} + \frac{m}{\alpha^a} + \frac{n}{\alpha^b} = 3$, then $m + n$ is equal to :

(1) 8 (2) 7 (3) 3 (4) 11

Ans. Official answer NTA (4)

Sol.

Question ID : 3475772494

8. There are 12 points in a plane, no three of which are in the same straight line, except 5 points which are collinear. Then the total number of triangles that can be formed with the vertices at any three of these 12 points is :

(1) 210 (2) 220 (3) 200 (4) 230

Ans. Official answer NTA (1)

Sol.

Question ID : 3475772503

9. Given below are two statements :

Statement I : $\lim\limits_{x\to 0}\left(\frac{\tan^{-1}x + \log_e\sqrt{\frac{1+x}{1-x}} - 2x}{x^5}\right) = \frac{2}{5}$

Statement II : $\lim\limits_{x\to 1}\left(x^{\frac{2}{1-x}}\right) = \frac{1}{e^2}$

In the light of the above statements, choose the ***correct*** answer from the options given below.

(1) Statement I is true but Statement II is false

(2) Both Statement I and Statement II are true

(3) Both Statement I and Statement II are false

(4) Statement I is false but Statement II is true

Ans. Official answer NTA (2)

Sol.

Question ID : 3475772506

10. The integral $\int_{-1}^{\frac{3}{2}} \left(\left|\pi^2 x \sin(\pi x)\right|\right) dx$ is equal to :

(1) $1 + 3\pi$ (2) $2 + 3\pi$ (3) $4 + \pi$ (4) $3 + 2\pi$

Ans. Official answer NTA (1)

Sol.

Question ID : 3475772493

11. If $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \ldots\infty = \frac{\pi^4}{90}$,

$\frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \ldots\infty = \alpha$,

$\frac{1}{2^4} + \frac{1}{4^4} + \frac{1}{6^4} + \ldots\infty = \beta$,

then $\frac{\alpha}{\beta}$ is equal to :

(1) 14 (2) 18 (3) 15 (4) 23

Ans. Official answer NTA (3)

Sol.

Question ID : 3475772497

12. A line passing through the point P(a, 0) makes an acute angle α with the positive x-axis. Let this line be rotated about the point P through an angle $\frac{\alpha}{2}$ in the clock-wise direction. If in the new position, the slope of the line is $2-\sqrt{3}$ and its distance from the origin is $\frac{1}{\sqrt{2}}$, then the value of $3a^2\tan^2\alpha - 2\sqrt{3}$ is :

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

Ans. Official answer NTA (1)

Sol.

Question ID : 3475772502

13. Let the values of λ for which the shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-\lambda}{3}=\frac{y-4}{4}=\frac{z-5}{5}$ is $\frac{1}{\sqrt{6}}$ be λ_1 and λ_2. Then the radius of the circle passing through the points (0, 0), (λ_1, λ_2) and (λ_2, λ_1) is :

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

Ans. Official answer NTA (1)

Sol.

Question ID : 3475772507

14. Let $f(x) = x - 1$ and $g(x) = e^x$ for $x \in R$. If $\frac{dy}{dx} = \left(e^{-2\sqrt{x}}g\left(f\left(f(x)\right)\right) - \frac{y}{\sqrt{x}}\right)$, $y(0) = 0$, then $y(1)$ is :

(1) $\frac{1-e^2}{e^4}$ (2) $\frac{2e-1}{e^3}$ (3) $\frac{e-1}{e^4}$ (4) $\frac{1-e^3}{e^4}$

Ans. Official answer NTA (3)

Sol.

Question ID : 3475772490

15. Let $A=\left\{\theta\in[0,2\pi]:1+10\,\mathrm{Re}\left(\frac{2\cos\theta+i\sin\theta}{\cos\theta-3i\sin\theta}\right)=0\right\}$. Then $\sum_{\theta\in A}\theta^2$ is equal to :

(1) $6\pi^2$ (2) $8\pi^2$ (3) $\frac{27}{4}\pi^2$ (4) $\frac{21}{4}\pi^2$

Ans. Official answer NTA (4)

Sol.

Question ID : 3475772495

16. The number of integral terms in the expansion of $\left(5^{\frac{1}{2}}+7^{\frac{1}{8}}\right)^{1016}$ is :

(1) 128 (2) 129 (3) 127 (4) 130

Ans. Official answer NTA (1)

Sol.

Question ID : 3475772488

17. Let A = {0, 1, 2, 3, 4, 5}. Let R be a relation on A defined by (x, y) ∈ R if and only if max {x, y} ∈ {3, 4}. Then among the statements :

(S_1) : The number of elements in R is 18, and

(S_2) : The relation R is symmetric but neither reflexive nor transitive

(1) both are true (2) both are false (3) only (S_2) is true (4) only (S_1) is true

Ans. Official answer NTA (3)

Sol.

Question ID : 3475772504

18. Let the function $f(x)=\frac{x}{3}+\frac{3}{x}+3$, $x\neq 0$ be strictly increasing in $(-\infty,\alpha_1)\cup(\alpha_2,\infty)$ and strictly decreasing in $(\alpha_3,\alpha_4)\cup(\alpha_4,\alpha_5)$. Then $\sum_{i=1}^{5}\alpha_i^2$ is equal to :

(1) 40 (2) 48 (3) 36 (4) 28

Ans. Official answer NTA (3)

Sol.

Question ID : 3475772500

19. The value of $\cot^{-1}\left(\frac{\sqrt{1+\tan^2(2)}-1}{\tan(2)}\right)-\cot^{-1}\left(\frac{\sqrt{1+\tan^2\left(\frac{1}{2}\right)}+1}{\tan\left(\frac{1}{2}\right)}\right)$ is equal to :

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

Ans. Official answer NTA (3)

Sol.

Question ID : 3475772499

20. Let the ellipse $3x^2+py^2=4$ pass through the centre C of the circle $x^2+y^2-2x-4y-11=0$ of radius r. Let f_1, f_2 be the focal distances of the point C on the ellipse. Then $6f_1f_2-r$ is equal to :

(1) 74 (2) 70 (3) 78 (4) 68

Ans. Official answer NTA (2)

Sol.

SECTION – B

Question ID : 3475772509

21. The product of the last two digits of $(1919)^{1919}$ is _____.

Ans. Official answer NTA (63)

Sol.

Question ID : 3475772512

22. Let the area of the bounded region $\{(x, y) : 0 \le 9x \le y^2, y \ge 3x-6\}$ be A. Then 6A is equal to _____.

Ans. Official answer NTA (15)

Sol.

Question ID : 3475772510

23. Let r be the radius of the circle, which touches x-axis at point (a, 0), $a < 0$ and the parabola $y^2 = 9x$ at the point (4, 6). Then r is equal to _____.

Ans. Official answer NTA (30)

Sol.

Question ID : 3475772511

24. Let the area of the triangle formed by the lines $x + 2 = y - 1 = z$, $\frac{x-3}{5} = \frac{y}{-1} = \frac{z-1}{1}$ and $\frac{x}{-3} = \frac{y-3}{3} = \frac{z-2}{1}$ be A. Then A^2 is equal to _____.

Ans. Official answer NTA (56)

Sol.

Question ID : 3475772508

25. Let the domain of the function $f(x) = \cos^{-1}\left(\frac{4x+5}{3x-7}\right)$ be $[\alpha, \beta]$ and the domain of $g(x) = \log_2(2 - 6\log_{27}(2x + 5))$ be (γ, δ). Then $|7(\alpha + \beta) + 4(\gamma + \delta)|$ is equal to _____.

Ans. Official answer NTA (96)

Sol.