

JEE MAIN DETERMINANTS — PROPERTIES OF DETERMINANTS (JEE) — PYQS

Max. Marks: 44

Questions: 11

Section A (MCQ) — 11 questions

Q.1 If $f: \mathbb{N} \rightarrow \mathbb{Z}$ is defined by

$$f(n) = \begin{vmatrix} n & -1 & -5 \\ -2n^2 & 3(2k+1) & 2k+1 \\ -3n^3 & 3k(2k+1) & 3k(k+2)+1 \end{vmatrix}, k \in \mathbb{N},$$

and $\sum_{n=1}^k f(n) = 98$, then k is equal to :

[JEE Main 2026 (Online) 5th April Evening Shift]

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

Scan or tap for the full solution



Q.2 Among the statements :

I: If

$$\begin{vmatrix} 1 & \cos \alpha & \cos \beta \\ \cos \alpha & 1 & \cos \gamma \\ \cos \beta & \cos \gamma & 1 \end{vmatrix} = \begin{vmatrix} 0 & \cos \alpha & \cos \beta \\ \cos \alpha & 0 & \cos \gamma \\ \cos \beta & \cos \gamma & 0 \end{vmatrix},$$

then $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = \frac{3}{2}$, and

II: If $\begin{vmatrix} x^2+x & x+1 & x-2 \\ 2x^2+3x-1 & 3x & 3x-3 \\ x^2+2x+3 & 2x-1 & 2x-1 \end{vmatrix} = px+q$, then $p^2 = 196q^2$.

[JEE Main 2026 (Online) 23rd January Morning Shift]

- (1) both are true (2) both are false
(3) only I is true (4) only II is true

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Q.3 If $y(x) = \begin{vmatrix} \sin x & \cos x & \sin x + \cos x + 1 \\ 27 & 28 & 27 \\ 1 & 1 & 1 \end{vmatrix}$, $x \in \mathbb{R}$,

then $\frac{d^2y}{dx^2} + y$ is equal to

[JEE Main 2025 (Online) 3rd April Morning Shift]

- (1) 28 (2) 27 (3) -1 (4) 1

Scan or tap for the full solution



Q.4 Let M and m respectively be the maximum and the minimum values of

$$f(x) = \begin{vmatrix} 1 + \sin^2 x & \cos^2 x & 4\sin 4x \\ \sin^2 x & 1 + \cos^2 x & 4\sin 4x \\ \sin^2 x & \cos^2 x & 1 + 4\sin 4x \end{vmatrix}, x \in \mathbb{R}$$

Then $M^4 - m^4$ is equal to :

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) 1280 (2) 1040 (3) 1215 (4) 1295

Scan or tap for the full solution



Q.5 For some a, b , let

$$f(x) = \begin{vmatrix} a + \frac{\sin x}{x} & 1 & b \\ a & 1 + \frac{\sin x}{x} & b \\ a & 1 & b + \frac{\sin x}{x} \end{vmatrix}, x \neq 0,$$

$\lim_{x \rightarrow 0} f(x) = \lambda + \mu a + \nu b$. Then $(\lambda + \mu + \nu)^2$ is equal

to : [JEE Main 2025 (Online) 24th January Evening Shift]

- (1) 25 (2) 16 (3) 9 (4) 36

Scan or tap for the full solution



Q.6 If $\alpha \neq a$, $\beta \neq b$, $\gamma \neq c$ and $\begin{vmatrix} \alpha & b & c \\ a & \beta & c \\ a & b & \gamma \end{vmatrix} = 0$, then

$\frac{a}{\alpha-a} + \frac{b}{\beta-b} + \frac{\gamma}{\gamma-c}$ is equal to :

[JEE Main 2024 (Online) 8th April Evening Shift]

- (1) 2 (2) 3 (3) 1 (4) 0

Scan or tap for the full solution



Q.7 For $\alpha, \beta \in \mathbb{R}$ and a natural number n , let

$$A_r = \begin{vmatrix} r & 1 & \frac{n^2}{2} + \alpha \\ 2r & 2 & n^2 - \beta \\ 3r-2 & 3 & \frac{n(3n-1)}{2} \end{vmatrix}. \text{ Then } 2A_{10} - A_8 \text{ is}$$

[JEE Main 2024 (Online) 6th April Morning Shift]

- (1) $4\alpha + 2\beta$ (2) 0 (3) $2n$ (4) $2\alpha + 4\beta$

Scan or tap for the full solution



Q.8 If $A = \begin{bmatrix} \sqrt{2} & 1 \\ -1 & \sqrt{2} \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$, $C = ABA^T$ and $X = A^T C^2 A$, then $\det X$ is equal to :

[JEE Main 2024 (Online) 1st February Morning Shift]

- (1) 243 (2) 729 (3) 27 (4) 891

Scan or tap for the full solution



Q.9 If $f(x) = \begin{vmatrix} 2\cos^4 x & 2\sin^4 x & 3 + \sin^2 2x \\ 3 + 2\cos^4 x & 2\sin^4 x & \sin^2 2x \\ 2\cos^4 x & 3 + 2\sin^4 x & \sin^2 2x \end{vmatrix}$, then $\frac{1}{5}f'(0)$ is equal to :

[JEE Main 2024 (Online) 30th January Morning Shift]

- (1) 2 (2) 1 (3) 0 (4) 6

Scan or tap for the full solution



Q.10 Let $A = \begin{bmatrix} 2 & 1 & 2 \\ 6 & 2 & 11 \\ 3 & 3 & 2 \end{bmatrix}$ and $P = \begin{bmatrix} 1 & 2 & 0 \\ 5 & 0 & 2 \\ 7 & 1 & 5 \end{bmatrix}$. The sum of the prime factors of $|P^{-1}AP - 2I|$ is equal to

[JEE Main 2024 (Online) 29th January Evening Shift]

- (1) 66 (2) 27 (3) 23 (4) 26

Scan or tap for the full solution



Q.11 The values of α , for which

$$\begin{vmatrix} 1 & \frac{3}{2} & \alpha + \frac{3}{2} \\ 1 & \frac{1}{3} & \alpha + \frac{1}{3} \\ 2\alpha + 3 & 3\alpha + 1 & 0 \end{vmatrix} = 0, \text{ lie in the interval}$$

[JEE Main 2024 (Online) 27th January Evening Shift]

- (1) $(-2, 1)$ (2) $\left(-\frac{3}{2}, \frac{3}{2}\right)$
(3) $(-3, 0)$ (4) $(0, 3)$

Scan or tap for the full solution



ANSWER KEY

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	1	2	3	1	2	4	1	2	3	4	3