

JEE MAIN DETERMINANTS — ADJOINT AND INVERSE OF A MATRIX — PYQS

Max. Marks: 56
Questions: 14

Section A (MCQ) — 10 questions

Q.1 Let $A = \begin{bmatrix} \alpha & 1 & 2 \\ 2 & 3 & 0 \\ 0 & 4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -5\alpha & 0 \\ 0 & 4\alpha & -2\alpha \end{bmatrix} + \text{adj}(A)$. If $\det(B) = 66$, then $\det(\text{adj}(A))$ equals :

[JEE Main 2026 (Online) 8th April Evening Shift]

- (1) 289 (2) 361 (3) 441 (4) 529

Scan or tap for the full solution



Q.2 Let A be a 3×3 matrix such that $A^T \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 5 \\ 2 \\ 1 \end{bmatrix}$, $A^T \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 3 \\ 1 \\ 1 \end{bmatrix}$, $A \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \\ 4 \end{bmatrix}$ and $A \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 3 \\ 1 \end{bmatrix}$.

If $\det(A) = 1$, then $\det(\text{adj}(A^2 + A))$ is equal to:

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

- (1) 16 (2) 25 (3) 49 (4) 64

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Q.3 Let $A = \begin{bmatrix} 1 & 1 & 2 \\ -2 & 0 & 1 \\ 1 & 3 & 5 \end{bmatrix}$. Then the sum of all elements of the matrix $\text{adj}(\text{adj}(2(\text{adj } A)^{-1}))$ is equal to:

[JEE Main 2026 (Online) 4th April Morning Shift]

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

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Q.4 Let $P = [p_{ij}]$ and $Q = [q_{ij}]$ be two square matrices of order 3 such that $q_{ij} = 2^{(i+j-1)}p_{ij}$ and $\det(Q) = 2^{10}$. Then the value of $\det(\text{adj}(\text{adj } P))$ is:

[JEE Main 2026 (Online) 24th January Evening Shift]

- (1) 81 (2) 16 (3) 124 (4) 32

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Q.5 Let $f(x) = \int \frac{7x^{10} + 9x^8}{(1+x^2+2x^9)^2} dx$, $x > 0$, $\lim_{x \rightarrow 0} f(x) = 0$ and $f(1) = \frac{1}{4}$.

If $A = \begin{bmatrix} 0 & 0 & 1 \\ \frac{1}{4} & f'(1) & 1 \\ \alpha^2 & 4 & 1 \end{bmatrix}$ and $B = \text{adj}(\text{adj } A)$ be such

that $|B| = 81$, then α^2 is equal to

[JEE Main 2026 (Online) 24th January Evening Shift]

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

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Q.6 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 $\det(\text{adj}(\text{adj}(3A))) = 2^m \cdot 3^n$, $m, n \in \mathbb{N}$, then $m + n$ is equal to

[JEE Main 2025 (Online) 8th April Evening Shift]

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

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Q.7 Let A be a 3×3 matrix such that $|\text{adj}(\text{adj}(\text{adj } A))| = 81$.

If $S = \left\{ n \in \mathbb{Z} : \left(|\text{adj}(\text{adj } A)| \right)^{\frac{(n-1)^2}{2}} = |A|^{(3n^2 - 5n - 4)} \right\}$, then $\sum_{n \in S} |A|^{(n^2 + n)}$ is equal to :

[JEE Main 2025 (Online) 7th April Morning Shift]

- (1) 820 (2) 866 (3) 750 (4) 732

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Q.8 Let A be a matrix of order 3×3 and $|A| = 5$. If $|2\text{adj}(3A\text{adj}(2A))| = 2^\alpha \cdot 3^\beta \cdot 5^\gamma$, $\alpha, \beta, \gamma \in \mathbb{N}$, then $\alpha + \beta + \gamma$ is equal to

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

- (1) 26 (2) 27 (3) 25 (4) 28

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- Q.9** Let $a \in \mathbb{R}$ and A be a matrix of order 3×3 such that $\det(A) = -4$ and $A + I = \begin{bmatrix} 1 & a & 1 \\ 2 & 1 & 0 \\ a & 1 & 2 \end{bmatrix}$, where I is the identity matrix of order 3×3 . If $\det((a+1)\text{adj}((a-1)A))$ is $2^m 3^n$, $m, n \in \{0, 1, 2, \dots, 20\}$, then $m + n$ is equal to :

[JEE Main 2025 (Online) 2nd April Morning Shift]

- (1) 14 (2) 17 (3) 15 (4) 16

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- Q.10** Let $A = [a_{ij}] = \begin{bmatrix} \log_5 128 & \log_4 5 \\ \log_5 8 & \log_4 25 \end{bmatrix}$. If A_{ij} is the cofactor of a_{ij} , $C_{ij} = \sum_{k=1}^2 a_{ik} A_{jk}$, $1 \leq i, j \leq 2$, and $C = [C_{ij}]$, then $8|C|$ is equal to :

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

- (1) 288 (2) 262 (3) 222 (4) 242

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**Section B (Numerical) — 4 questions**

- Q.11** Let $A = \begin{bmatrix} -1 & 1 & -1 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ satisfy

$$A^2 + \alpha(\text{adj}(\text{adj}(A))) + \beta(\text{adj}(A)(\text{adj}(\text{adj}(A)))) = \begin{bmatrix} 2 & -2 & 2 \\ -2 & 0 & -1 \\ 0 & 0 & -1 \end{bmatrix} \text{ for}$$

some $\alpha, \beta \in \mathbb{R}$.Then $(\alpha - \beta)^2$ is equal to _____.

[JEE Main 2026 (Online) 6th April Morning Shift]

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- Q.12** Let $|A| = 6$, where A is a 3×3 matrix. If $|\text{adj}(3\text{adj}(A^2 \cdot \text{adj}(2A)))| = 2^m \cdot 3^n$, $m, n \in \mathbb{N}$, then $m + n$ is equal to _____.

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

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- Q.13** Let A be a 3×3 matrix such that $A + A^T = O$. If $A \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} 3 \\ 3 \\ 2 \end{bmatrix}$, $A^2 \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} -3 \\ 19 \\ -24 \end{bmatrix}$ and

$$\det(\text{adj}(2\text{adj}(A+I))) = (2)^\alpha \cdot (3)^\beta \cdot (11)^\gamma, \quad \alpha, \beta, \gamma \text{ are}$$

non-negative integers, then $\alpha + \beta + \gamma$ is equal to _____

[JEE Main 2026 (Online) 22nd January Morning Shift]

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- Q.14** Let I be the identity matrix of order 3×3 and for the matrix $A = \begin{bmatrix} \lambda & 2 & 3 \\ 4 & 5 & 6 \\ 7 & -1 & 2 \end{bmatrix}$, $|A| = -1$. Let B be the inverse of the matrix $\text{adj}(A\text{adj}(A^2))$. Then $|(\lambda B + I)|$ is equal to _____

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

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**ANSWER KEY****Section A (MCQ) — 10 questions**

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

Section B (Numerical) — 4 questions

Ques.	11	12	13	14
Ans.	4	62	18	38 or -38