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MATHEMATICS · JEE MAIN

Determinants

Previous Year Questions with answers

98 questions · **85** papers · **2002–2026** · newest paper first

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What is in this PDF: every Determinants question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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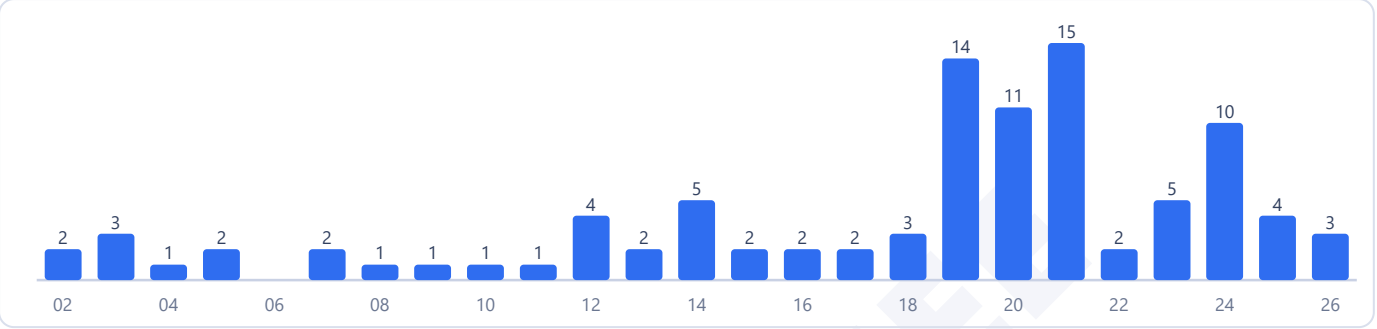
Chapter at a glance

1.4%	98	58 of 162	89 / 9
of Mathematics questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Falling: 0.3 questions per paper in 2024–2026 against 0.5 in 2019–2023.

Questions per year



Counts are the questions we hold: 98 in 85 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)



How often it comes up

Determinants covers scalar evaluations, row operations, and area applications under Unit 3: Matrices and Determinants in the Class 12 curriculum, holding rank 27 of 29 chapters with a 1.4% share of the mathematics section. In the 2019 to 2026 test window, Determinants contributed 64 questions across 162 exam papers, making up 1.4% of the mathematics section and holding rank 27 of 29 chapters. During the earlier 2002 to 2018 testing span, it accounted for 34 questions across 38 papers with a 2.6% share. In the recent 2024 to 2026 seasons, the chapter saw 17 questions across 58 papers, capturing a 1.1% share. Comparing 2002 to 2018 against 2024 to 2026, the trend is down, whereas comparing 2019 to 2026 against 2024 to 2026, its testing share has remained about the same.

The chapter has appeared every year from 2019 to 2026. Students met an average of 0.4 questions per paper across 2019 to 2026, and 0.3 questions per paper between 2024 and 2026. Nine numerical answer questions were set between 2019 and 2026.

Most-asked topics

The syllabus organizes across two main topics:

- Evaluation & Properties: The dominant topic with 80 total questions (53 in 2019 to 2026), evaluated continuously through 2026. Focuses on row and column linear transformations, factoring polynomials from rows, determinants containing trigonometric entries (sin x, cos x), differentiation of determinants row-by-row, evaluating high matrix power determinants, and summation of determinants over integer series.
- Applications: Produced 18 total questions (11 in 2019 to 2026), last tested in 2024. Explores condition of collinearity for three coplanar points, area of triangles in coordinate geometry, and non-trivial solutions for homogeneous systems.

What the questions look like

Examiners present algebraic and calculus-infused determinants. A standard question sets up a 3x3 determinant where entries in one row or column depend on a variable x, asking candidates to find its derivative at x = 0 or determine local extrema by expanding after applying elementary row operations.

Other problems feature trigonometric identities where rows contain squares of sine and cosine functions. Students simplify the determinant to zero or a constant using column operations like C1 -> C1 + C2 before evaluating limits or summing series.

How to practise it

Prepare for determinants by mastering elementary operations and differentiation rules:

1. Use elementary operations before expanding: Never expand a 3x3 determinant directly if elementary operations like R1 -> R1 - R2 can generate two zeros in any single row or column. 2. Differentiate row by row: To differentiate det(A(x)), differentiate row one while keeping rows two and three unchanged, then differentiate row two keeping others unchanged, and finally differentiate row three, summing all three resulting determinants. 3. Sum over a single column: When summing an integer index n inside a determinant, if only one column depends on n, distribute the summation sign directly inside that column while leaving the other columns untouched. 4. Exploit skew-symmetry: The determinant of an odd-order skew-symmetric matrix is always zero; the determinant of an even-order skew-symmetric matrix is always a perfect square. 5. Apply factor theorem: If setting x = a makes two rows or columns identical, then (x - a) is a polynomial factor of the determinant.

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Q1 JEE Main 2026 · 5 Apr · Shift 2 MCQ

If $f : \mathbf{N} \to \mathbf{Z}$ is defined by

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

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

(A) 3

(B) 4

(C) 5

(D) 6

Answer: (A) 3 · Official NTA final key

Q2 JEE Main 2026 · 23 Jan · Shift 1 MCQ

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 $p^2 = 196q^2$,

(A) both are true

(B) only I is true

(C) both are false

(D) only II is true

Answer: (C) both are false · Official NTA final key

Q3 JEE Main 2026 · 22 Jan · Shift 1 MCQ

If $A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$, then the determinant of the matrix $\left(A^{2025} - 3A^{2024} + A^{2023}\right)$ is

(A) 28

(B) 16

(C) 24

(D) 12

Answer: (B) 16 · Official NTA final key

Q4 JEE Main 2025 · 7 Apr · Shift 1 Numerical

The number of singular matrices of order 2, whose elements are from the set $\{2, 3, 6, 9\}$, is _____ .

Numerical value type: the answer is a number.

Answer: 36. · Key from source paper

Q5 JEE Main 2025 · 3 Apr · Shift 1 MCQ

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

(A) 27

(B) 28

(C) 1

(D) -1

Answer: (D) -1 · Key from source paper

Q6 JEE Main 2025 · 29 Jan · Shift 1 MCQ

Let M and m respectively be the maximum and the minimum values of $f(x)=\begin{vmatrix}1+\sin^2 x & \cos^2 x & 4\sin 4x\\ \sin^2 x & 1+\cos^2 x & 4\sin 4x\\ \sin^2 x & \cos^2 x & 1+4\sin 4x\end{vmatrix}$, $x\in\mathbf{R}$ Then M^4-m^4 is equal to :

(A) 1280

(B) 1295

(C) 1215

(D) 1040

Answer: (A) 1280 · Key from source paper

Q7 JEE Main 2025 · 24 Jan · Shift 2 MCQ

For some a, b, let $f(x)=\begin{vmatrix}\mathrm{a}+\frac{\sin x}{x} & 1 & \mathrm{b}\\ \mathrm{a} & 1+\frac{\sin x}{x} & \mathrm{b}\\ \mathrm{a} & 1 & \mathrm{b}+\frac{\sin x}{x}\end{vmatrix}$, $x\neq 0$, $\lim_{x\to 0} f(x)=\lambda+\mu\mathrm{a}+\nu\mathrm{b}$. Then $(\lambda+\mu+\nu)^2$ is equal to :

(A) 16

(B) 25

(C) 9

(D) 36

Answer: (A) 16 · Key from source paper

Q8 JEE Main 2024 · 9 Apr · Shift 2 Numerical

Consider the matrices : $A=\begin{bmatrix}2 & -5\\ 3 & m\end{bmatrix}$, $B=\begin{bmatrix}20\\ m\end{bmatrix}$ and $X=\begin{bmatrix}x\\ y\end{bmatrix}$. Let the set of all m, for which the system of equations $AX=B$ has a negative solution (i.e., $x<0$ and $y<0$), be the interval (a,b).

Then $8\int_a^b |A|\,dm$ is equal to _____

Numerical value type: the answer is a number.

Answer: 450. · Key from source paper

Q9 JEE Main 2024 · 8 Apr · Shift 2 MCQ

If $\alpha \neq \mathrm{a}, \beta \neq \mathrm{b}, \gamma \neq \mathrm{c}$ and $\begin{vmatrix} \alpha & \mathrm{b} & \mathrm{c} \\ \mathrm{a} & \beta & \mathrm{c} \\ \mathrm{a} & \mathrm{b} & \gamma \end{vmatrix} = 0$, then $\frac{\mathrm{a}}{\alpha-\mathrm{a}} + \frac{\mathrm{b}}{\beta-\mathrm{b}} + \frac{\gamma}{\gamma-\mathrm{c}}$ is equal to:

(A) 3

(B) 0

(C) 1

(D) 2

Answer: (B) 0 · Key from source paper

Q10 JEE Main 2024 · 4 Apr · Shift 1 MCQ

If the system of equations

$$x + (\sqrt{2}\sin\alpha)y + (\sqrt{2}\cos\alpha)z = 0$$

$$x + (\cos\alpha)y + (\sin\alpha)z = 0$$

$$x + (\sin\alpha)y - (\cos\alpha)z = 0$$

has a non-trivial solution, then $\alpha \in \left(0, \frac{\pi}{2}\right)$ is equal to :

(A) $\frac{11\pi}{24}$

(B) $\frac{5\pi}{24}$

(C) $\frac{7\pi}{24}$

(D) $\frac{3\pi}{4}$

Answer: (B) $\frac{5\pi}{24}$ · Key from source paper

Q11 JEE Main 2024 · 4 Apr · Shift 1 Numerical

Let A be a 3×3 matrix of non-negative real elements such that $A\begin{bmatrix}1\\1\\1\end{bmatrix} = 3\begin{bmatrix}1\\1\\1\end{bmatrix}$. Then the maximum value of $\det(A)$ is _____

Numerical value type: the answer is a number.

Answer: 27. · Key from source paper

Q12 JEE Main 2024 · 1 Feb · Shift 1 MCQ

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

(A) 243
(B) 729
(C) 27
(D) 891

Answer: (B) 729 · Key from source paper

Q13 JEE Main 2024 · 31 Jan · Shift 1 MCQ

If $f(x) = \begin{vmatrix} x^3 & 2x^2+1 & 1+3x \\ 3x^2+2 & 2x & x^3+6 \\ x^3-x & 4 & x^2-2 \end{vmatrix}$ for all $x \in \mathbb{R}$, then $2f(0) + f'(0)$ is equal to

(A) 48
(B) 24
(C) 42
(D) 18

Answer: (C) 42 · Key from source paper

Q14 JEE Main 2024 · 30 Jan · Shift 1 MCQ

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 _____.

(A) 0
(B) 1
(C) 2
(D) 6

Answer: (A) 0 · Key from source paper

Q15 JEE Main 2024 · 29 Jan · Shift 1 MCQ

Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \alpha & \beta \\ 0 & \beta & \alpha \end{bmatrix}$ and $|2A|^3 = 2^{21}$ where $\alpha, \beta \in Z$, Then a value of α is

(A) 3
(B) 5
(C) 17
(D) 9

Answer: (B) 5 · Key from source paper

Q16 JEE Main 2024 · 29 Jan · Shift 2 MCQ

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 $\left|P^{-1}AP-2I\right|$ is equal to

(A) 26
(B) 27
(C) 66
(D) 23

Answer: (A) 26 · Key from source paper

Q17 JEE Main 2024 · 27 Jan · Shift 2 MCQ

The values of α, for which

$$\begin{vmatrix}1 & \frac{3}{2} & \alpha+\frac{3}{2}\\ 1 & \frac{1}{3} & \alpha+\frac{1}{3}\\ 2\alpha+3 & 3\alpha+1 & 0\end{vmatrix}=0$$

, lie in the interval

(A) $(-2,1)$
(B) $(-3,0)$
(C) $-\frac{3}{2},\frac{3}{2}$
(D) $(0,3)$

Answer: (B) $(-3,0)$ · Key from source paper

Q18 JEE Main 2023 · 12 Apr · Shift 1 Numerical

Let $D_k=\begin{vmatrix}1 & 2k & 2k-1\\ n & n^2+n+2 & n^2\\ n & n^2+n & n^2+n+2\end{vmatrix}$. If $\sum_{k=1}^{n}D_k=96$, then n is equal to _____.

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q19 JEE Main 2023 · 11 Apr · Shift 2 MCQ

If $\begin{vmatrix}x+1 & x & x\\ x & x+\lambda & x\\ x & x & x+\lambda^2\end{vmatrix}=\frac{9}{8}(103x+81)$, then $\lambda, \frac{\lambda}{3}$ are the roots of the equation

(A) $4x^2 + 24x - 27 = 0$

(B) $4x^2 - 24x - 27 = 0$

(C) $4x^2 + 24x + 27 = 0$

(D) $4x^2 - 24x + 27 = 0$

Answer: (D) $4x^2 - 24x + 27 = 0$ · Key from source paper

Q20 JEE Main 2023 · 1 Feb · Shift 1 MCQ

Let $fx = \begin{vmatrix} 1+\sin^2 x & \cos^2 x & \sin 2x \\ \sin^2 x & 1+\cos^2 x & \sin 2x \\ \sin^2 x & \cos^2 x & 1+\sin 2x \end{vmatrix}$, $x \in \frac{\pi}{6}, \frac{\pi}{3}$. If α and β respectively are the maximum and the minimum values of f, then

(A) $\beta^2 - 2\sqrt{\alpha} = \frac{19}{4}$

(B) $\beta^2 + 2\sqrt{\alpha} = \frac{19}{4}$

(C) $\alpha^2 - \beta^2 = 4\sqrt{3}$

(D) $\alpha^2 + \beta^2 = \frac{9}{2}$

Answer: (A) $\beta^2 - 2\sqrt{\alpha} = \frac{19}{4}$ · Key from source paper

Q21 JEE Main 2023 · 29 Jan · Shift 2 MCQ

The set of all values of $t \in \mathbb{R}$, for which the matrix $\begin{bmatrix} e^t & e^{-t}(\sin t - 2\cos t) & e^{-t}(-2\sin t - \cos t) \\ e^t & e^{-t}(2\sin t + \cos t) & e^{-t}(\sin t - 2\cos t) \\ e^t & e^{-t}\cos t & e^{-t}\sin t \end{bmatrix}$ is invertible, is

(A) $\left\{(2k+1)\frac{\pi}{2}, k \in \mathbb{Z}\right\}$

(B) $\left\{k\pi + \frac{\pi}{4}, k \in \mathbb{Z}\right\}$

(C) $\{k\pi, k \in \mathbb{Z}\}$

(D) $\mathbb{R}$

Answer: (D) $\mathbb{R}$ · Key from source paper

Q22 JEE Main 2023 · 24 Jan · Shift 1 MCQ

Let α be a root of the equation $a - cx^2 + b - ax + c - b = 0$ where $a,\ b,\ c$ are distinct real numbers such that the matrix $\begin{pmatrix} \alpha^2 & \alpha & 1 \\ 1 & 1 & 1 \\ a & b & c \end{pmatrix}$ is singular. Then the value of $\frac{a-c^2}{b-ac-b} + \frac{b-a^2}{a-cc-b} + \frac{c-b^2}{a-cb-a}$ is

(A) 6
(B) 3
(C) 9
(D) 12

Answer: (B) 3 · Key from source paper

Q23 JEE Main 2022 · 29 Jul · Shift 1 Numerical

Let p and $p+2$ be prime numbers and let
$\Delta = \begin{vmatrix} p! & (p+1)! & (p+2)! \\ (p+1)! & (p+2)! & (p+3)! \\ (p+2)! & (p+3)! & (p+4)! \end{vmatrix}$
Then the sum of the maximum values of α and β, such that p^{α} and $(p+2)^{\beta}$ divide Δ, is _____.

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q24 JEE Main 2022 · 27 Jun · Shift 2 MCQ

Let $f(x) = \begin{vmatrix} a & -1 & 0 \\ ax & a & -1 \\ ax^2 & ax & a \end{vmatrix}$, $a \in R$. Then the sum of the squares of all the values of a for $2f'(10) - f'(5) + 100 = 0$ is

(A) 117
(B) 106
(C) 125
(D) 136

Answer: (C) 125 · Key from source paper

Q25 JEE Main 2021 · 31 Aug · Shift 1 MCQ

If $\mathrm{a_r} = \cos\frac{2r\pi}{9} + i\sin\frac{2r\pi}{9}, r = 1, 2, 3, \ldots, i = \sqrt{-1}$, then the determinant $\begin{vmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a_6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ is equal to :

(A) $\mathrm{a_9}$
(B) $a_1a_9 - a_3a_7$
(C) a_5
(D) $a_2a_6 - a_4a_8$

Answer: (B) $a_1a_9 - a_3a_7$ · Key from source paper

Q26 JEE Main 2021 · 31 Aug · Shift 2 MCQ

If $\alpha + \beta + \gamma = 2\pi$, then the system of equations
$x + \cos\gamma\, y + \cos\beta\, z = 0$

$\cos\gamma\, x + y + \cos\alpha\, z = 0$
$\cos\beta\, x + \cos\alpha\, y + z = 0$
has :

(A) infinitely many solutions
(B) a unique solution
(C) no solution
(D) exactly two solutions

Answer: (A) infinitely many solutions · Key from source paper

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Q27 JEE Main 2021 · 27 Aug · Shift 2 MCQ

Let $A = \begin{bmatrix} [x+1] & [x+2] & [x+3] \\ [x] & [x+3] & [x+3] \\ [x] & [x+2] & [x+4] \end{bmatrix}$, where $[x]$ denotes the greatest integer less than or equal to x. If $\det(A) = 192$, then the set of values of x is in the interval:

(A) $[62, 63)$
(B) $[65, 66)$
(C) $[60, 61)$
(D) $[68, 69)$

Answer: (A) $[62, 63)$ · Key from source paper

Q28 JEE Main 2021 · 26 Aug · Shift 1 MCQ

Let $\theta \in \left(0, \frac{\pi}{2}\right)$. If the system of linear equations
$\left(1+\cos^2\theta\right)x + \sin^2\theta y + 4\sin 3\theta z = 0$
$\cos^2\theta x + \left(1+\sin^2\theta\right)y + 4\sin 3\theta z = 0$
$\cos^2\theta x + \sin^2\theta y + (1+4\sin 3\theta)z = 0$
has a non-trivial solution, then the value of θ is:

(A) $\frac{4\pi}{9}$
(B) $\frac{5\pi}{18}$
(C) $\frac{7\pi}{18}$
(D) $\frac{\pi}{18}$

Answer: (C) $\frac{7\pi}{18}$ · Key from source paper

Q29 JEE Main 2021 · 27 Jul · Shift 1 Numerical

Let $f(x) = \begin{vmatrix} \sin^2 x & -2+\cos^2 x & \cos 2x \\ 2+\sin^2 x & \cos^2 x & \cos 2x \\ \sin^2 x & \cos^2 x & 1+\cos 2x \end{vmatrix}$, $x \in [0, \pi]$. Then the maximum value of $f(x)$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q30 JEE Main 2021 · 25 Jul · Shift 2 MCQ

The number of distinct real roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval $-\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$ is:

(A) 4

(B) 1

(C) 2

(D) 3

Answer: (B) 1 · Key from source paper

Q31 JEE Main 2021 · 20 Jul · Shift 1 Numerical

Let a, b, c, d be in arithmetic progression with common difference λ. If $\begin{vmatrix} x+a-c & x+b & x+a \\ x-1 & x+c & x+b \\ x-b+d & x+d & x+c \end{vmatrix} = 2$, then value of λ^2 is equal to _____.

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q32 JEE Main 2021 · 18 Mar · Shift 1 MCQ

The solutions of the equation $\begin{vmatrix} 1+\sin^2 x & \sin^2 x & \sin^2 x \\ \cos^2 x & 1+\cos^2 x & \cos^2 x \\ 4\sin 2x & 4\sin 2x & 1+4\sin 2x \end{vmatrix} = 0, (0 < x < \pi)$, are

(A) $\frac{\pi}{12}, \frac{\pi}{6}$

(B) $\frac{\pi}{6}, \frac{5\pi}{6}$

(C) $\frac{5\pi}{12}, \frac{7\pi}{12}$

(D) $\frac{7\pi}{12}, \frac{11\pi}{12}$

Answer: (D) $\frac{7\pi}{12}, \frac{11\pi}{12}$ · Key from source paper

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Q33 JEE Main 2021 · 18 Mar · Shift 1 MCQ

Let α, β, γ be the real roots of the equation, $x^3 + ax^2 + bx + c = 0$, $(a, b, c \in R$ and $a, b \neq 0)$. If the system of equations (in, u, v, w) given by $\alpha u + \beta v + \gamma w = 0$, $\beta u + \gamma v + \alpha w = 0$, $\gamma u + \alpha v + \beta w = 0$ has non-trivial solution, the value of $\frac{a^2}{b}$ is

(A) 5
(B) 3
(C) 1
(D) 0

Answer: (B) 3 · Key from source paper

Q34 JEE Main 2021 · 18 Mar · Shift 2 MCQ

Let the system of linear equations
$4x + \lambda y + 2z = 0$
$2x - y + z = 0$
$\mu x + 2y + 3z = 0,\ \lambda, \mu \in R$
has a non-trivial solution. Then which of the following is true?

(A) $\mu = 6,\ \lambda \in R$
(B) $\lambda = 2,\ \mu \in R$
(C) $\lambda = 3,\ \mu \in R$
(D) $\mu = -6,\ \lambda \in R$

Answer: (A) $\mu = 6,\ \lambda \in R$ · Key from source paper

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Q35 JEE Main 2021 · 17 Mar · Shift 2 MCQ

If x, y, z are in arithmetic progression with common difference $d, x \neq 3d$, and the determinant of the matrix $\begin{bmatrix} 3 & 4\sqrt{2} & x \\ 4 & 5\sqrt{2} & y \\ 5 & k & z \end{bmatrix}$ is zero, then the value of k^2 is

(A) 72
(B) 12
(C) 36
(D) 6

Answer: (A) 72 · Key from source paper

Q36 JEE Main 2021 · 16 Mar · Shift 1 Numerical

Let $P = \begin{bmatrix} -30 & 20 & 56 \\ 90 & 140 & 112 \\ 120 & 60 & 14 \end{bmatrix}$ and $A = \begin{bmatrix} 2 & 7 & \omega^2 \\ -1 & -\omega & 1 \\ 0 & -\omega & -\omega + 1 \end{bmatrix}$ where $\omega = \frac{-1+i\sqrt{3}}{2}$, and I_3 be the identity matrix of order 3. If the determinant of the matrix $\left(P^{-1}AP - I_3\right)^2$ is $\alpha\omega^2$, then the value of α is equal to _____.

Numerical value type: the answer is a number.

Answer: 36. · Key from source paper

Q37 JEE Main 2021 · 16 Mar · Shift 2 MCQ

The maximum value of $f(x)=\begin{vmatrix}\sin^2 x & 1+\cos^2 x & \cos 2x\\ 1+\sin^2 x & \cos^2 x & \cos 2x\\ \sin^2 x & \cos^2 x & \sin 2x\end{vmatrix}$, $x \in R$ is

(A) $\sqrt{7}$

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

(C) $\sqrt{5}$

(D) 5

Answer: (C) $\sqrt{5}$ · Key from source paper

Q38 JEE Main 2021 · 26 Feb · Shift 1 MCQ

The value of $\begin{vmatrix}(a+1)(a+2) & a+2 & 1\\ (a+2)(a+3) & a+3 & 1\\ (a+3)(a+4) & a+4 & 1\end{vmatrix}$ is

(A) 0

(B) $(a+2)(a+3)(a+4)$

(C) -2

(D) $(a+1)(a+2)(a+3)$

Answer: (C) -2 · Key from source paper

Q39 JEE Main 2021 · 25 Feb · Shift 2 MCQ

Let A be a 3×3 matrix with det $(A)=4$. Let R_i denote the ith row of A. If a matrix B is obtained by performing the operation $R_2 \to 2R_2+5R_3$ on $2\ A$, then det (B) is equal to :

(A) 64

(B) 16

(C) 128

(D) 80

Answer: (A) 64 · Key from source paper

Q40 JEE Main 2020 · 6 Sep · Shift 1 MCQ

Let m and M be respectively the minimum and maximum value values of

$$\begin{vmatrix}\cos^2 x & 1+\sin^2 x & \sin 2x\\ 1+\cos^2 x & \sin^2 x & \sin 2x\\ \cos^2 x & \sin^2 x & 1+\sin 2x\end{vmatrix}$$

Then the ordered pair (m, M) is equal to:

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(A) $(3, 3)$
(B) $(-3, -1)$
(C) $(4, 1)$
(D) $(1, 3)$

Answer: (B) $(-3, -1)$ · Key from source paper

Q41 JEE Main 2020 · 6 Sep · Shift 2 · Numerical

The sum of distinct values of λ for which the system of equations :
$(\lambda - 1)\, x + (3\lambda + 1)\, y + 2\lambda z = 0$
$(\lambda - 1)\, \mathrm{x} + (4\lambda - 2)\, \mathrm{y} + (\lambda + 3)\, \mathrm{z} = 0$
$2\mathrm{x} + (3\lambda + 1)\, \mathrm{y} + 3\,(\lambda - 1)\, \mathrm{z} = 0,$
Has non-zero solutions, is _____.

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q42 JEE Main 2020 · 5 Sep · Shift 1 · MCQ

If the minimum and the maximum values of the function $f : \left[\frac{\pi}{4}, \frac{\pi}{2}\right] \to R$, defined by $f(\theta) = \begin{vmatrix} -\sin^2\theta & -1-\sin^2\theta & 1 \\ -\cos^2\theta & -1-\cos^2\theta & 1 \\ 12 & 10 & -2 \end{vmatrix}$ are m and M respectively, then the ordered pair (m, M) is equal to :

(A) $\left(0, 2\sqrt{2}\right)$
(B) $(-4, 0)$
(C) $(-4,\ 4)$
(D) $(0, 4)$

Answer: (B) $(-4, 0)$ · Key from source paper

Q43 JEE Main 2020 · 5 Sep · Shift 2 · MCQ

If the system of linear equations
$x + y + 3z = 0$
$x + 3y + k^2 z = 0$
$3x + y + 3z = 0$
has a non-zero solution $(x,\ y,\ z)$ for some k ∈ R, then x + $\left(\frac{y}{z}\right)$ is equal to :

(A) -3
(B) 9
(C) 3
(D) -9

Answer: (A) -3 · Key from source paper

Q44 JEE Main 2020 · 5 Sep · Shift 2 MCQ

If $a+x=b+y=c+z+1$, where $a,\ b,\ c,\ x,\ y,\ z$ are non-zero distinct real numbers, then $\begin{vmatrix} x & a+y & x+a \\ y & b+y & y+b \\ z & c+y & z+c \end{vmatrix}$ is equal to :

(A) $y(b-a)$

(B) $y\,(a-b)$

(C) 0

(D) $y(a-c)$

Answer: (B) $y\,(a-b)$ · Key from source paper

Q45 JEE Main 2020 · 4 Sep · Shift 2 MCQ

Suppose the vectors x_1, x_2 and x_3 are the solutions of the system of linear equations, $Ax=b$ when the vector b on the right side is equal to b_1, b_2 and b_3 respectively. If $x_1=\begin{bmatrix}1\\1\\1\end{bmatrix}, x_2=\begin{bmatrix}0\\2\\1\end{bmatrix}, x_3=\begin{bmatrix}0\\0\\1\end{bmatrix}$; $b_1=\begin{bmatrix}1\\0\\0\end{bmatrix}, b_2=\begin{bmatrix}0\\2\\0\end{bmatrix}, b_3=\begin{bmatrix}0\\0\\2\end{bmatrix}$, then the determinant of A is equal to

(A) 4

(B) 2

(C) $\frac{1}{2}$

(D) $\frac{3}{2}$

Answer: (B) 2 · Key from source paper

Q46 JEE Main 2020 · 3 Sep · Shift 1 MCQ

If $\Delta=\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ 2x-3 & 3x-4 & 4x-5 \\ 3x-5 & 5x-8 & 10x-17 \end{vmatrix}=Ax^3+Bx^2+Cx+D$, then $B+C$ is equal to :

(A) -1

(B) 1

(C) -3

(D) 9

Answer: (C) -3 · Key from source paper

Q47 JEE Main 2020 · 2 Sep · Shift 1 MCQ

Let A be a 2×2 real matrix with entries from $\{0,1\}$ and $|A|\neq 0$. Consider the following two statements;

(P) If $A\neq I_2$, then $|A|=-1$

(Q) If $|A| = 1$, then $tr(A) = 2$
Where I_2 denotes 2×2 identity matrix and $tr(A)$ denotes the sum of the diagonal entries of A. Then

(A) (P) is false and (Q) is true
(B) Both (P) and (Q) are false
(C) (P) is true and (Q) is false
(D) Both (P) and (Q) are true

Answer: (A) (P) is false and (Q) is true · Checked by our team

Q48 JEE Main 2020 · 9 Jan · Shift 2 MCQ

Let $a - 2b + c = 1$.
If $f(x) = \begin{vmatrix} x+a & x+2 & x+1 \\ x+b & x+3 & x+2 \\ x+c & x+4 & x+3 \end{vmatrix}$, then:

(A) $f(-50) = 501$
(B) $f(-50) = -1$
(C) $f(50) = -501$
(D) $f(50) = 1$

Answer: (D) $f(50) = 1$ · Key from source paper

Q49 JEE Main 2020 · 7 Jan · Shift 1 MCQ

If the system of linear equations
$2x + 2ay + az = 0$
$2x + 3by + bz = 0$
$2x + 4cy + cz = 0$,
where $a, b, c \in R$ are non-zero and distinct; has a non-zero solution, then

(A) $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in $A.P.$
(B) a, b, c are in $G.P.$
(C) $a + b + c = 0$
(D) a, b, c are in $A.P.$

Answer: (A) $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in $A.P.$ · Key from source paper

Q50 JEE Main 2020 · 7 Jan · Shift 2 MCQ

Let $\mathrm{A} = [a_{ij}]$ and $\mathrm{B} = [b_{ij}]$ be two 3×3 real matrices such that $b_{ij} = (3)^{(i+j-2)} a_{ij}$, where $i, j = 1, 2, 3$. If the determinant of B is 81, then determinant of A is

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(A) $\frac{1}{3}$
(B) 3
(C) $\frac{1}{81}$
(D) $\frac{1}{9}$

Answer: (D) $\frac{1}{9}$ · Key from source paper

Q51 JEE Main 2019 · 12 Apr · Shift 2 MCQ

A value of $\theta \in \left(0, \frac{\pi}{3}\right)$, for which $\begin{vmatrix} 1+\cos^2\theta & \sin^2\theta & 4\cos 6\theta \\ \cos^2\theta & 1+\sin^2\theta & 4\cos 6\theta \\ \cos^2\theta & \sin^2\theta & 1+4\cos 6\theta \end{vmatrix} = 0$, is

(A) $\frac{\pi}{9}$
(B) $\frac{7\pi}{24}$
(C) $\frac{7\pi}{36}$
(D) $\frac{\pi}{18}$

Answer: (A) $\frac{\pi}{9}$ · Key from source paper

Q52 JEE Main 2019 · 10 Apr · Shift 1 MCQ

$\Delta_1 = \begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x & \sin 2\theta & \cos 2\theta \\ -\sin 2\theta & -x & 1 \\ \cos 2\theta & 1 & x \end{vmatrix}$, $x \neq 0$; then for all $\theta \in \left(0, \frac{\pi}{2}\right)$:

(A) $\Delta_1 + \Delta_2 = -2\left(x^3 + x - 1\right)$
(B) $\Delta_1 - \Delta_2 = x\left(\cos 2\theta - \cos 4\theta\right)$
(C) $\Delta_1 + \Delta_2 = -2x^3$
(D) $\Delta_1 - \Delta_2 = -2x^3$

Answer: (C) $\Delta_1 + \Delta_2 = -2x^3$ · Key from source paper

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Q53 JEE Main 2019 · 10 Apr · Shift 2 MCQ

The sum of the real roots of the equation

$\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2x & x+2 \end{vmatrix} = 0$

is equal to:

(A) 0
(B) -4
(C) 6
(D) 1

Answer: (A) 0 · Key from source paper

Q54 JEE Main 2019 · 9 Apr · Shift 1 MCQ

Let α and β be the roots of the equation $x^2 + x + 1 = 0$. Then for $y \neq 0$ in R, $\begin{vmatrix} y+1 & \alpha & \beta \\ \alpha & y+\beta & 1 \\ \beta & 1 & y+\alpha \end{vmatrix}$ is equal to

(A) y^3
(B) $y(y^2 - 1)$
(C) $y^3 - 1$
(D) $y(y^2 - 3)$

Answer: (A) y^3 · Key from source paper

Q55 JEE Main 2019 · 8 Apr · Shift 1 MCQ

The greatest value of $c \in R$ for which the system of linear equations $x - cy - cz = 0$, $cx - y + cz = 0$, $cx + cy - z = 0$ has a non-trivial solution, is

(A) -1
(B) 2
(C) $\frac{1}{2}$
(D) 0

Answer: (C) $\frac{1}{2}$ · Key from source paper

Q56 JEE Main 2019 · 8 Apr · Shift 2 MCQ

Let the numbers 2, b, c be in an A.P. and $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & b & c \\ 4 & b^2 & c^2 \end{bmatrix}$. If $\det(A) \in [2, 16]$, then c lies in the interval:

(A) 2,3
(B) 4,6
(C) 3,2 + $2^{\frac{3}{4}}$
(D) 2 + $2^{\frac{3}{4}}$,4

Answer: (B) 4,6 · Key from source paper

Q57 JEE Main 2019 · 12 Jan · Shift 2 MCQ

If $A = \begin{bmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{bmatrix}$, then for all $\theta \in \left(\frac{3\pi}{4}, \frac{5\pi}{4}\right)$, $\det(A)$ lies in the interval :

(A) $\left(1, \frac{5}{2}\right]$
(B) $\left[\frac{5}{2}, 4\right)$
(C) $\left(\frac{3}{2}, 3\right]$
(D) $\left(0, \frac{3}{2}\right]$

Answer: (C) $\left(\frac{3}{2}, 3\right]$ · Key from source paper

Q58 JEE Main 2019 · 12 Jan · Shift 2 MCQ

The set of all values of λ for which the system of linear equations

$x - 2y - 2z = \lambda x$

$x + 2y + z = \lambda y$

$-x - y = \lambda z$

has a non-trivial solution :

(A) is an empty set
(B) contains more than two elements
(C) is a singleton
(D) contains exactly two elements

Answer: (C) is a singleton · Key from source paper

Q59 JEE Main 2019 · 11 Jan · Shift 2 MCQ

If $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)(x+a+b+c)^2$, $x \neq 0$ and $a+b+c \neq 0$, then x is equal to

(A) abc
(B) $-(a+b+c)$
(C) $2(a+b+c)$
(D) $-2(a+b+c)$

Answer: (D) $-2(a+b+c)$ · Key from source paper

Q60 JEE Main 2019 · 11 Jan · Shift 2 MCQ

Let A and B be two invertible matrices of order 3×3. If $\det\left(\mathrm{ABA}^{\mathrm{T}}\right) = 8$ and $\det\left(\mathrm{AB}^{-1}\right) = 8$, then $\det\left(\mathrm{BA}^{-1}\,\mathrm{B}^{\mathrm{T}}\right)$ is equal to

(A) $\frac{1}{4}$
(B) 1
(C) $\frac{1}{16}$
(D) 16

Answer: (C) $\frac{1}{16}$ · Key from source paper

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Q61 JEE Main 2019 · 10 Jan · Shift 1 MCQ

Let $d \in R$, and $A = \begin{bmatrix} -2 & 4+d & (\sin\theta)-2 \\ 1 & (\sin\theta)+2 & d \\ 5 & (2\sin\theta)-d & (-\sin\theta)+2+2d \end{bmatrix}$, $\theta \in [0,\ 2\pi]$. If the minimum value of $det(A)$ is 8, then a value of d is:

(A) $2\left(\sqrt{2}+2\right)$

(B) $2\left(\sqrt{2}+1\right)$

(C) -5

(D) -7

Answer: (C) -5 · Key from source paper

Q62 JEE Main 2019 · 10 Jan · Shift 2 MCQ

Let $A = \begin{bmatrix} 2 & b & 1 \\ b & b^2+1 & b \\ 1 & b & 2 \end{bmatrix}$, where $b > 0$. Then the minimum value of $\frac{\det(A)}{b}$ is:

(A) $2\sqrt{3}$

(B) $-2\sqrt{3}$

(C) $\sqrt{3}$

(D) $-\sqrt{3}$

Answer: (A) $2\sqrt{3}$ · Key from source paper

Q63 JEE Main 2019 · 10 Jan · Shift 2 MCQ

Let $a_1,\ a_2,\ a_3 \ldots, a_{10}$ be in $G.\ P.$ with $a_i > 0$ for $i = 1,\ 2,\ \ldots,\ 10$ and S be the set of pairs $(r,\ k)$, $r,\ k \in N$ (the set of natural numbers) for which

$$\begin{vmatrix} \log_e a_1^r a_2^k & \log_e a_2^r a_3^k & \log_e a_3^r a_4^k \\ \log_e a_4^r a_5^k & \log_e a_5^r a_6^k & \log_e a_6^r a_7^k \\ \log_e a_7^r a_8^k & \log_e a_8^r a_9^k & \log_e a_9^r a_{10}^k \end{vmatrix} = 0$$

Then the number of elements in S, is:

(A) Infinitely many

(B) 4

(C) 10

(D) 2

Answer: (A) Infinitely many · Key from source paper

Q64 JEE Main 2019 · 9 Jan · Shift 2 MCQ

If $A = \begin{bmatrix} e^t & e^{-t}\cos t & e^{-t}\sin t \\ e^t & -e^{-t}\cos t - e^{-t}\sin t & -e^{-t}\sin t + e^{-t}\cos t \\ e^t & 2e^{-t}\sin t & -2e^{-t}\cos t \end{bmatrix}$, then A is:

(A) Invertible only if $t = \pi$

(B) Not invertible for any $t \in R$

(C) Invertible only if $t = \frac{\pi}{2}$

(D) Invertible for all $t \in R$

Answer: (D) Invertible for all $t \in R$ · Key from source paper

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Q65 JEE Main 2018 · 15 Apr · Shift 1 MCQ

If $f(x) = \begin{vmatrix} \cos x & x & 1 \\ 2\sin x & x^2 & 2x \\ \tan x & x & 1 \end{vmatrix}$, then $\lim_{x \to 0} \frac{f'(x)}{x}$

(A) Exists and is equal to -2

(B) Does not exist

(C) Exist and is equal to 0

(D) Exists and is equal to 2

Answer: (A) Exists and is equal to -2 · Key from source paper

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Q66 JEE Main 2018 · 8 Apr · Offline MCQ

If the system of linear equations

$x + ky + 3z = 0$

$3x + ky - 2z = 0$

$2x + 4y - 3z = 0$

has a non-zero solution $(x,\ y,\ z)$, then $\frac{xz}{y^2}$ is equal to:

(A) 30

(B) -10

(C) 10

(D) -30

Answer: (C) 10 · Key from source paper

Q67 JEE Main 2018 · 8 Apr · Offline MCQ

If $\begin{vmatrix} x-4 & 2x & 2x \\ 2x & x-4 & 2x \\ 2x & 2x & x-4 \end{vmatrix} = (A+Bx)(x-A)^2$, then the ordered pair $(A,\ B)$ is equal to

(A) $(4, 5)$

(B) $(-4,\ -5)$

(C) $(-4,\ 3)$

(D) $(-4,\ 5)$

Answer: (D) $(-4,\ 5)$ · Key from source paper

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Q68 JEE Main 2017 · 8 Apr · Online MCQ

If $S=\left\{x\in[0,\ 2\pi]:\begin{vmatrix}0 & \cos x & -\sin x\\ \sin x & 0 & \cos x\\ \cos x & \sin x & 0\end{vmatrix}=0\right\}$, then $\sum_{x\in S}\tan\left(\frac{\pi}{3}+x\right)$ is equal to:

(A) $4+2\sqrt{3}$

(B) $-4-2\sqrt{3}$

(C) $-2+\sqrt{3}$

(D) $-2-\sqrt{3}$

Answer: (B) $-4-2\sqrt{3}$ · Key from source paper

Q69 JEE Main 2017 · 2 Apr · Offline MCQ

Let ω be a complex number such that $2\omega+1=z$ where $z=\sqrt{-3}$. If

$$\begin{vmatrix}1 & 1 & 1\\ 1 & -\omega^2-1 & \omega^2\\ 1 & \omega^2 & \omega^7\end{vmatrix}=3k,$$

Then k can be equal to:

(A) $-z$

(B) $\frac{1}{z}$

(C) -1

(D) 1

Answer: (A) $-z$ · Key from source paper

Q70 JEE Main 2016 · 9 Apr · Online MCQ

The number of distinct real roots of the equation, $\begin{vmatrix}\cos x & \sin x & \sin x\\ \sin x & \cos x & \sin x\\ \sin x & \sin x & \cos x\end{vmatrix}=0$ in the interval $\left[-\frac{\pi}{4},\ \frac{\pi}{4}\right]$ is :

(A) 1

(B) 4

(C) 2

(D) 3

Answer: (C) 2 · Key from source paper

Q71 JEE Main 2016 · 3 Apr · Offline MCQ

The system of linear equations

$x+\lambda y-z=0$

$\lambda x-y-z=0$

$x+y-\lambda z=0$

has a non -trivial solution for

(A) Exactly two values of λ

(B) Exactly three values of λ

(C) Infinitely many values of λ

(D) Exactly one value of λ

Answer: (B) Exactly three values of λ · Key from source paper

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Q72 JEE Main 2015 · 11 Apr · Online MCQ

If $\begin{vmatrix} x^2+x & x+1 & x-2 \\ 2x^2+3x-1 & 3x & 3x-3 \\ x^2+2x+3 & 2x-1 & 2x-1 \end{vmatrix} = ax - 12$, then a is equal to:

(A) -24

(B) 24

(C) -12

(D) 12

Answer: (B) 24 · Key from source paper

Q73 JEE Main 2015 · 4 Apr · Offline MCQ

The set of all values of λ for which the system of linear equations:

$2x_1 - 2x_2 + x_3 = \lambda x_1$

$2x_1 - 3x_2 + 2x_3 = \lambda x_2$

$-x_1 + 2x_2 = \lambda x_3$

has a non-trivial solution,

(A) Contains more than two elements.

(B) Is an empty set.

(C) Is a singleton.

(D) Contains two elements.

Answer: (D) Contains two elements. · Key from source paper

Q74 JEE Main 2014 · 19 Apr · Online MCQ

If $\Delta_r = \begin{vmatrix} r & 2r-1 & 3r-2 \\ \frac{n}{2} & n-1 & a \\ \frac{1}{2}n(n-1) & (n-1)^2 & \frac{1}{2}(n-1)(3n+4) \end{vmatrix}$, then the value of $\sum_{r=1}^{n-1} \Delta_r$

(A) Is independent of both a and n

(B) Depends only on a

(C) Depends only on n

(D) Depends both on a and n

Answer: (A) Is independent of both a and n · Key from source paper

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Q75 JEE Main 2014 · 12 Apr · Online MCQ

If

$$\begin{matrix} a^2 & b^2 & c^2 \\ |(a+\lambda)^2 & (b+\lambda)^2 & (c+\lambda^2) \\ (a-\lambda)^2 & (b-\lambda^2) & (-\lambda^2 \end{matrix}\Bigg)$$

$$= k\lambda \begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}, \lambda \neq 0$$

then k is equal to:

(A) $4\lambda abc$

(B) $-4\lambda abc$

(C) $4\lambda^2$

(D) $-4\lambda^2$

Answer: (C) $4\lambda^2$ · Key from source paper

Q76 JEE Main 2014 · 12 Apr · Online MCQ

If $f(\theta) = \begin{vmatrix} 1 & \cos\theta & 1 \\ -\sin\theta & 1 & -\cos\theta \\ -1 & \sin\theta & 1 \end{vmatrix}$ and A and B are respectively the maximum and the minimum values of $f(\theta)$, then (A, B) is equal to:

(A) $(3, -1)$

(B) $(4, 2-\sqrt{2})$

(C) $(2+\sqrt{2}, 2-\sqrt{2})$

(D) $(2+\sqrt{2}, -1)$

Answer: (C) $(2+\sqrt{2}, 2-\sqrt{2})$ · Key from source paper

Q77 JEE Main 2014 · 11 Apr · Online MCQ

Let for $i = 1, 2, 3, p_i(x)$ be a polynomial of degree 2 in $x, p_i'(x)$ and $p_i''(x)$ be the first and second order derivatives of $p_i(x)$ respectively. Let,

$$A(x) = \begin{bmatrix} p_1(x) & p_1'(x) & p_1''(x) \\ p_2(x) & p_2'(x) & p_2''(x) \\ p_3(x) & p_3'(x) & p_3''(x) \end{bmatrix}$$

and $B(x) = [A(x)]^T A(x)$. Then determinant of $B(x)$:

(A) is a polynomial of degree 6 in x.
(B) is a polynomial of degree 3 in x.
(C) is a polynomial of degree 2 in x.
(D) does not depend on x.

Answer: (D) does not depend on x. · Checked by our team

Q78 JEE Main 2014 · 6 Apr · Offline MCQ

If $\alpha, \beta \neq 0$, $f(n) = \alpha^n + \beta^n$ and $\begin{vmatrix} 3 & 1+f(1) & 1+f(2) \\ 1+f(1) & 1+f(2) & 1+f(3) \\ 1+f(2) & 1+f(3) & 1+f(4) \end{vmatrix} = K(1-\alpha)^2(1-\beta)^2(\alpha-\beta)^2$, then K is equal to

(A) 1
(B) -1
(C) $\alpha\beta$
(D) $\frac{1}{\alpha\beta}$

Answer: (A) 1 · Key from source paper

Q79 JEE Main 2013 · 25 Apr · Online MCQ

Let $S = \left\{ \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} : a_{ij} \in \{0,1,2\}, a_{11} = a_{22} \right\}$ Then the number of non-singular matrices in the set S is :

(A) 27
(B) 24
(C) 10
(D) 20

Answer: (D) 20 · Key from source paper

Q80 JEE Main 2013 · 9 Apr · Online MCQ

If a, b, c are sides of a scalene triangle, then the value of $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is :

(A) non - negative
(B) negative
(C) positive
(D) non-positive

Answer: (B) negative · Key from source paper

Q81 AIEEE 2012 · 26 May · Online MCQ

Statement 1: If the system of equations $x + ky + 3z = 0, 3x + ky - 2z = 0, 2x + 3y - 4z = 0$ has a nontrivial solution, then the value of k is $\frac{31}{2}$. Statement 2: A system of three homogeneous equations in three variables has a non trivial solution if the determinant of the coefficient matrix is zero.

(A) Statement 1 is false, Statement 2 is true.

(B) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 1.

(C) Statement 1 is true, Statement 2 is true,, Statement 2 is not a correct explanation for Statement 1.

(D) Statement 1 is true, Statement 2 is false.

Answer: (A) Statement 1 is false, Statement 2 is true. · Key from source paper

Q82 AIEEE 2012 · 19 May · Online MCQ

If $a, b, c,$ are non zero complex numbers satisfying $a^2 + b^2 + c^2 = 0$ and $\begin{vmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ac & bc & a^2+b^2 \end{vmatrix} = ka^2b^2c^2$, then k is equal to

(A) 1

(B) 3

(C) 4

(D) 2

Answer: (C) 4 · Key from source paper

Q83 AIEEE 2012 · 12 May · Online MCQ

If $\begin{vmatrix} -2a & a+b & a+c \\ b+a & -2b & b+c \\ c+a & b+c & -2c \end{vmatrix} = \alpha(a+b)(b+c)(c+a) \neq 0$ then α is equal to

(A) $a + b + c$

(B) abc

(C) 4

(D) 1

Answer: (C) 4 · Key from source paper

Q84 AIEEE 2012 · Offline MCQ

Let P and Q be 3×3 matrices with $P \neq Q$. If $P^3 = Q^3$ and $P^2Q = Q^2P$, then determinant of $(P^2 + Q^2)$ is equal to

(A) -2
(B) 1
(C) 0
(D) -1

Answer: (C) 0 · Key from source paper

Q85 AIEEE 2011 MCQ

The number of values of k for which the linear equations $4x + ky + 2z = 0;\ kx + 4y + z = 0;\ 2x + 2y + z = 0$ possess a non-zero solution is

(A) 2
(B) 1
(C) zero
(D) 3

Answer: (A) 2 · Key from source paper

Q86 AIEEE 2010 MCQ

The number of 3×3 non-singular matrices, with four entries as 1 and all other entries as 0 , is

(A) 5
(B) 6
(C) at least 7
(D) less than 4

Answer: (C) at least 7 · Key from source paper

Q87 AIEEE 2009 MCQ

Let a, b, c be such that $b(a + c) \neq 0$. If $\begin{vmatrix} a & a+1 & a-1 \\ -b & b+1 & b-1 \\ c & c-1 & c+1 \end{vmatrix} + \begin{vmatrix} a+1 & b+1 & c-1 \\ a-1 & b-1 & c+1 \\ (-1)^{n+2}a & (-1)^{n+1}b & (-1)^n c \end{vmatrix} = 0,$ then the value of ' n ' is

(A) zero
(B) any even integer
(C) any odd integer
(D) any integer

Answer: (C) any odd integer · Key from source paper

Q88 AIEEE 2008 MCQ

Let a, b, c be any real numbers. Suppose that there are real numbers x, y, z not all zero such that $x = cy + bz$, $y = az + cx$ and $z = bx + ay$. Then $a^2 + b^2 + c^2 + 2abc$ is equal to

(A) 2
(B) -1
(C) 0
(D) 1

Answer: (D) 1 · Key from source paper

Q89 AIEEE 2007 MCQ

Let $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$. If $|A^2| = 25$, then $|\alpha|$ equals

(A) 5^2
(B) 1
(C) 1/5
(D) 5

Answer: (C) 1/5 · Key from source paper

Q90 AIEEE 2007 MCQ

If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for $x \neq 0, y \neq 0$ then D is

(A) divisible by neither x nor y
(B) divisible by both x and y
(C) divisible by x but not y
(D) divisible by y but not x

Answer: (B) divisible by both x and y · Key from source paper

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Q91 AIEEE 2005 MCQ

If $a^2 + b^2 + c^2 = -2$ and $f(x) = \begin{vmatrix} 1+a^2x & (1+b^2)x & (1+c^2)x \\ (1+a^2)x & 1+b^2x & (1+c^2)x \\ (1+a^2)x & (1+b^2)x & 1+c^2x \end{vmatrix}$ then $f(x)$ is a polynomial of degree

(A) 1
(B) 0
(C) 3
(D) 2

Answer: (D) 2 · Key from source paper

Q92 AIEEE 2005 MCQ

If $a_1, a_2, a_3, \ldots, a_n, \ldots$ are in G.P., then the determinant $\Delta = \begin{vmatrix} \log a_n & \log a_{n+1} & \log a_{n+2} \\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5} \\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8} \end{vmatrix}$ is equal to

(A) 1
(B) 0
(C) 4
(D) 2

Answer: (B) 0 · Key from source paper

Q93 AIEEE 2004 MCQ

If $a_1, a_2, a_3, \ldots, a_n, \ldots$ are in G.P., then the value of the determinant $\begin{vmatrix} \log a_n & \log a_{n+1} & \log a_{n+2} \\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5} \\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8} \end{vmatrix}$, is

(A) 0
(B) -2
(C) 2
(D) 1

Answer: (A) 0 · Key from source paper

Q94 AIEEE 2003 MCQ

If the system of linear equations $x + 2ay + az = 0$ $x + 3by + bz = 0$ $x + 4cy + cz = 0$ has a non-zero solution, then a, b, c

(A) satisfy $a + 2b + 3c = 0$
(B) are in A.P.
(C) are in G.P.
(D) are in H.P.

Answer: (D) are in H.P. · Key from source paper

Q95 AIEEE 2003 MCQ

If $1, \omega, \omega^2$ are the cube roots of unity, then $\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^n & \omega^{2n} & 1 \\ \omega^{2n} & 1 & \omega^n \end{vmatrix}$ is equal to

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(A) ω^2

(B) 0

(C) 1

(D) ω

Answer: (B) 0 · Key from source paper

Q96 AIEEE 2003 MCQ

If $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$ and vectors $(1, a, a^2)$, $(1, b, b^2)$ and $(1, c, c^2)$ are non-coplanar, then the product abc equals

(A) 0

(B) 2

(C) -1

(D) 1

Answer: (C) -1 · Key from source paper

Q97 AIEEE 2002 MCQ

l, m, n are the pth, q^{th} and r^{th} term of a G.P. all positive, then $\begin{vmatrix} \log l & p & 1 \\ \log m & q & 1 \\ \log n & r & 1 \end{vmatrix}$ equals

(A) -1

(B) 2

(C) 1

(D) 0

Answer: (D) 0 · Key from source paper

Q98 AIEEE 2002 MCQ

If $a > 0$ discriminant of $ax^2 + 2bx + c$ is -ve, then $\begin{vmatrix} a & b & ax+b \\ b & c & bx+c \\ ax+b & bx+c & 0 \end{vmatrix}$ is

(A) +ve

(B) $(ac - b^2)(ax^2 + 2bx + c)$

(C) -ve

(D) 0

Answer: (C) -ve · Key from source paper