Mathematics

Daily Practice Paper #1 · JEE Advanced 2026 · Class 12

SolveFlow · Demo Paper

Field	Value
Subject	Mathematics
Total Questions	10
Total Marks	40
Negative Marking	-1 per wrong answer
Time Suggested	30 minutes
Syllabus	Class 12 — Matrices, Derivatives, Integrals,
	Differential Equations, Vectors, 3D, Probability

CO & Bloom's Level Mapping

Q No.	Topic	CO	Bloom's Level
1	Matrices — Adjoint and Determinant	CO1	L3 — Apply
2	Continuity & Differentiability	CO2	L4 — Analyse
3	Applications of Derivatives — Extrema	CO2	L4 — Analyse
4	Integrals — Definite Integral	CO2	L3 — Apply
5	Differential Equations — Variables Sep.	CO3	L3 — Apply
6	Vectors — Cross Product	CO3	L3 — Apply
7	3D Geometry — Direction Cosines	CO4	L3 — Apply
8	Probability — Without Replacement	CO4	L3 — Apply
9	Relations & Functions — Injectivity	CO1	L4 — Analyse
10	Inverse Trig — Compound Angles	CO1	L3 — Apply

Instructions

- Each question carries **4 marks** for a correct answer.
- -1 **mark** is deducted for each incorrect answer.
- No marks are deducted for unattempted questions.
- Use of calculator is **not** permitted.
- All logarithms are to the natural base e unless specified.

Q1 | *Matrices & Determinants* Marks: 4 | CO/BL: CO1 / L3

If A is a 3×3 matrix with $|A| = 5$, then $|\text{adj}(A)|$ equals:

(A) 5

(B) 25

(C) 125

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

Solution — Correct Answer: (B)

For an $n \times n$ matrix, the key identity is:

$$|\text{adj}(A)| = |A|^{n-1}$$

Here $n = 3$ and $|A| = 5$:

$$|\text{adj}(A)| = 5^{3-1} = 5^2 = \boxed{25} \tag{1}$$

Key Point

Also: $A \cdot \text{adj}(A) = |A|\, I_n$. $|\text{adj}(\text{adj}(A))| = |A|^{(n-1)^2}$ (double adjoint).

Q2 | *Continuity & Differentiability* Marks: 4 | CO/BL: CO2 / L4

If $f(x) = |x - 2|$, then at $x = 2$, f is:

(A) Differentiable everywhere

(B) Not continuous at $x = 2$

(C) Continuous but **not** differentiable at $x = 2$

(D) Neither continuous nor differentiable at $x = 2$

Solution — Correct Answer: (C)

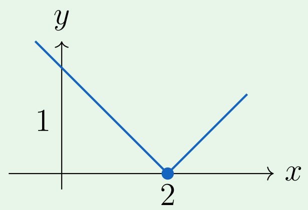
Continuity at $x = 2$: $\lim_{x\to 2^-} |x - 2| = 0 = \lim_{x\to 2^+} |x - 2| = f(2)$ ✓
Differentiability at $x = 2$:

$$\text{LHD} = \lim_{h\to 0^-} \frac{|2 + h - 2| - 0}{h} = \lim_{h\to 0^-} \frac{-h}{h} = -1 \tag{2}$$

$$\text{RHD} = \lim_{h\to 0^+} \frac{|2 + h - 2| - 0}{h} = \lim_{h\to 0^+} \frac{h}{h} = +1 \tag{3}$$

LHD $\neq$ RHD, so f is **not differentiable** at $x = 2$.

$\boxed{\text{Continuous but not differentiable at } x = 2}$



Key Point

A function with a sharp corner (like $|x - a|$) is always continuous but not differentiable at the corner point.

Q3 | *Applications of Derivatives — Local Extrema* Marks: 4 | CO/BL: CO2 / L4

The function $f(x) = 2x^3 - 9x^2 + 12x - 4$ has a local **maximum** at:

(A) $x = 1$

(B) $x = 2$

(C) $x = 3$

(D) $x = -1$

Solution — Correct Answer: (A)

$$f'(x) = 6x^2 - 18x + 12 = 6(x^2 - 3x + 2) = 6(x - 1)(x - 2) \tag{4}$$

Critical points: $x = 1$ and $x = 2$.
Second derivative test:

$$f''(x) = 12x - 18 \tag{5}$$

$$f''(1) = 12 - 18 = -6 < 0 \implies \text{local } \textbf{maximum} \text{ at } \boxed{x = 1} \tag{6}$$

$$f''(2) = 24 - 18 = +6 > 0 \implies \text{local minimum at } x = 2 \tag{7}$$

Key Point

Second derivative test: $f''(c) < 0 \Rightarrow$ local max; $f''(c) > 0 \Rightarrow$ local min; $f''(c) = 0 \Rightarrow$ test inconclusive (use first derivative test).

Q4 | *Definite Integrals* Marks: 4 | CO/BL: CO2 / L3

The value of $\int_0^{\pi/2} \sin 2x \, dx$ is:

(A) 0

(B) 1

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

(D) 2

Solution — Correct Answer: (B)

$$\int_0^{\pi/2} \sin 2x \, dx = \left[-\frac{\cos 2x}{2}\right]_0^{\pi/2} \tag{8}$$

$$= \left(-\frac{\cos \pi}{2}\right) - \left(-\frac{\cos 0}{2}\right) \tag{9}$$

$$= \left(-\frac{-1}{2}\right) - \left(-\frac{1}{2}\right) \tag{10}$$

$$= \frac{1}{2} + \frac{1}{2} = \boxed{1} \tag{11}$$

Key Point

$\int \sin(ax)\, dx = -\frac{\cos(ax)}{a} + C$. Property: $\int_0^{\pi/2} \sin^n x \, dx = \int_0^{\pi/2} \cos^n x \, dx$ (Wallis).

Q5 | *Differential Equations — Variable Separable* Marks: 4 | CO/BL: CO3 / L3

The general solution of $\frac{dy}{dx} = \frac{y}{x}$ is:

(A) $y = Cx^2$

(B) $y = Cx$

(C) $y = Ce^x$

(D) $y = \frac{C}{x}$

Solution — Correct Answer: (B)

Separating variables:

$$\frac{dy}{y} = \frac{dx}{x} \tag{12}$$

Integrating both sides:

$$\ln|y| = \ln|x| + \ln|C| \tag{13}$$
$$\ln|y| = \ln|Cx| \tag{14}$$
$$y = \boxed{Cx} \tag{15}$$

This represents a family of straight lines through the origin.

Key Point

Variable separable form: $f(y)\,dy = g(x)\,dx$. After integrating, always include the arbitrary constant C (or $\ln C$ if using log form).

Q6 | *Vectors — Cross Product Magnitude* Marks: 4 | CO/BL: CO3 / L3

If $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 2\hat{k}$, then $|\vec{a} \times \vec{b}|$ equals:

(A) $\sqrt{195}$

(B) $\sqrt{90}$

(C) $\sqrt{179}$

(D) $\sqrt{150}$

Solution — Correct Answer: (B)

$$\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{vmatrix}$$

$$= \hat{i}\big(3\cdot 2 - (-1)(-2)\big) - \hat{j}\big(2\cdot 2 - (-1)(1)\big) + \hat{k}\big(2(-2) - 3\cdot 1\big) \tag{16}$$
$$= \hat{i}(6-2) - \hat{j}(4+1) + \hat{k}(-4-3) \tag{17}$$
$$= 4\hat{i} - 5\hat{j} - 7\hat{k} \tag{18}$$

$$|\vec{a} \times \vec{b}| = \sqrt{4^2 + (-5)^2 + (-7)^2} = \sqrt{16+25+49} = \boxed{\sqrt{90} = 3\sqrt{10}}$$

Key Point

$|\vec{a} \times \vec{b}| = |\vec{a}||\vec{b}|\sin\theta$, where θ is the angle between them. It also equals the area of the parallelogram formed by $\vec{a}$ and $\vec{b}$.

Q7 | *3D Geometry — Direction Cosines* Marks: 4 | CO/BL: CO4 / L3

The angle θ between lines with direction cosines $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ and $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, 0\right)$ is:

(A) $90°$

(B) $60°$

(C) $45°$

(D) $\cos^{-1}\left(\frac{2}{\sqrt{6}}\right)$

Solution — Correct Answer: (D)

$$\cos\theta = l_1l_2 + m_1m_2 + n_1n_2 \tag{19}$$
$$= \frac{1}{\sqrt{3}} \cdot \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} \cdot \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} \cdot 0 \tag{20}$$
$$= \frac{1}{\sqrt{6}} + \frac{1}{\sqrt{6}} + 0 = \frac{2}{\sqrt{6}} \tag{21}$$

$$\theta = \boxed{\cos^{-1}\left(\frac{2}{\sqrt{6}}\right) \approx 35.26°}$$

Key Point

For direction cosines (l, m, n): $l^2 + m^2 + n^2 = 1$. Two lines are perpendicular iff $l_1l_2 + m_1m_2 + n_1n_2 = 0$.

Q8 | *Probability — Without Replacement* Marks: 4 | CO/BL: CO4 / L3

Two cards are drawn **without replacement** from a standard deck of 52 cards. The probability that **both** are aces is:

(A) $\frac{1}{221}$

(B) $\frac{1}{169}$

(C) $\frac{4}{52}$

(D) $\frac{1}{26}$

Solution — Correct Answer: (A)

$$P(\text{both aces}) = P(\text{1st ace}) \times P(\text{2nd ace} \mid \text{1st ace}) \tag{22}$$

$$= \frac{4}{52} \times \frac{3}{51} \tag{23}$$

$$= \frac{12}{2652} = \boxed{\frac{1}{221}} \tag{24}$$

Key Point

With replacement: $P = \frac{4}{52} \times \frac{4}{52} = \frac{1}{169}$. Without replacement: $P = \frac{4}{52} \times \frac{3}{51} = \frac{1}{221}$. The distinction matters whenever sampling is sequential.

Q9 | *Relations & Functions*Marks: 4 | CO/BL: CO1 / L4

The function $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = x^2$ is:

(A) One-one and onto

(B) One-one but not onto

(C) Onto but not one-one

(D) Neither one-one nor onto

Solution — Correct Answer: (D)

One-one (injective)? No. $f(2) = 4 = f(-2)$ but $2 \neq -2$. $\therefore$ *not* injective.
Onto (surjective)? No. For $y = -1 \in \mathbb{R}$, there is no $x \in \mathbb{R}$ such that $x^2 = -1$. $\therefore$ *not* surjective.
$\boxed{\text{Neither one-one nor onto}}$
Note: $f : \mathbb{R} \to [0, \infty)$ would make it surjective; $f : [0, \infty) \to [0, \infty)$ makes it bijective.

Key Point

Domain and codomain matter. $f(x) = x^2$ with domain $\mathbb{R}$ and codomain $\mathbb{R}$: neither injective nor surjective. Restricting to $[0, \infty) \to [0, \infty)$: bijective.

Q10 | *Inverse Trigonometry — Compound Angles*Marks: 4 | CO/BL: CO1 / L3

The value of $\sin\left(\tan^{-1}\frac{3}{4} + \tan^{-1}\frac{5}{12}\right)$ is:

(A) $\frac{33}{65}$

(B) $\frac{56}{65}$

(C) $\frac{63}{65}$

(D) $\frac{16}{65}$

Solution — Correct Answer: (B)

Let $\alpha = \tan^{-1}\frac{3}{4}$ and $\beta = \tan^{-1}\frac{5}{12}$.
From a right triangle: $\sin\alpha = \frac{3}{5}$, $\cos\alpha = \frac{4}{5}$; $\sin\beta = \frac{5}{13}$, $\cos\beta = \frac{12}{13}$.
Using the compound angle formula:

$$\begin{aligned} \sin(\alpha+\beta) &= \sin\alpha\cos\beta + \cos\alpha\sin\beta && (25)\\ &= \frac{3}{5}\cdot\frac{12}{13} + \frac{4}{5}\cdot\frac{5}{13} && (26)\\ &= \frac{36}{65} + \frac{20}{65} = \boxed{\frac{56}{65}} && (27) \end{aligned}$$

Key Point

For $\tan^{-1}(a/b)$: draw a right triangle with opposite $= a$, adjacent $= b$, hypotenuse $= \sqrt{a^2+b^2}$, then read off sin and cos directly.