

JEE MAIN CONTINUITY AND DIFFERENTIABILITY — PYQS

Max. Marks: 72
Questions: 18

Section A (MCQ) — 10 questions

Q.1 Let $f(x) = \begin{cases} \frac{1}{3}, & x \leq \frac{\pi}{2} \\ \frac{1}{2} \sin^2(x - \frac{\pi}{2}), & x > \frac{\pi}{2} \end{cases}$. If f is continuous at $x = \frac{\pi}{2}$, then the value of $\int_0^{3b-6} |x^2 + 2x - 3| dx$ is :

- [JEE Main 2026 (Online) 8th April Evening Shift]
- (1) 5 (2) 2 (3) 3 (4) 4

Scan or tap for the full solution



Q.2 If $y = \tan^{-1} \left(\frac{3\cos x - 4\sin x}{4\cos x + 3\sin x} \right) + 2\tan^{-1} \left(\frac{x}{1 + \sqrt{1 - x^2}} \right)$, then $\frac{dy}{dx}$ at $x = \frac{\sqrt{3}}{2}$ is equal to :

- [JEE Main 2026 (Online) 4th April Morning Shift]
- (1) 3 (2) -1 (3) 1 (4) 2

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Q.3 Let f be a real polynomial of degree n such that $f(x) = f'(x)f''(x)$, for all $x \in \mathbb{R}$. If $f(0) = 0$, then $36 \left(f'(2) + f''(2) + \int_0^2 f(x) dx \right)$ is equal to :

- [JEE Main 2026 (Online) 4th April Morning Shift]
- (1) 42 (2) 46 (3) 56 (4) 66

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Q.4 Let $f(x) = \lim_{\theta \rightarrow 0} \left(\frac{\cos \pi x - x \left(\frac{2}{\theta} \right) \sin(x-1)}{1 + x \left(\frac{2}{\theta} \right) (x-1)} \right)$, $x \in \mathbb{R}$.

Consider the following two statements :

- (I) $f(x)$ is discontinuous at $x = 1$.
 (II) $f(x)$ is continuous at $x = -1$.

Then, [JEE Main 2026 (Online) 28th January Evening Shift]

- (1) Neither (I) nor (II) is True
 (2) Only (II) is True
 (3) Only (I) is True
 (4) Both (I) and (II) are True

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Q.5 Let $\alpha, \beta \in \mathbb{R}$ be such that the function $f(x) = \begin{cases} 2\alpha \ln(x^2 - 2) + 2\beta x, & x < 1 \\ (\alpha + 3)x + (\alpha - \beta), & x \geq 1 \end{cases}$ be differentiable at all $x \in \mathbb{R}$. Then $34(\alpha + \beta)$ is equal to

- [JEE Main 2026 (Online) 24th January Morning Shift]
- (1) 48 (2) 84 (3) 36 (4) 24

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Q.6 Let $[t]$ denote the greatest integer less than or equal to t . If the function $f(x) = \begin{cases} b \sin \left(\frac{\pi}{2} \left(\frac{\pi}{2} (\cos x + \sin x) \cos x \right) \right), & x < 0 \\ \frac{\sin x}{2} - \frac{1}{2} \sin 2x, & x \geq 0 \end{cases}$ is continuous at $x = 0$, then $a^2 + b^2$ is equal to :

- [JEE Main 2026 (Online) 24th January Evening Shift]
- (1) $\frac{1}{2}$ (2) $\frac{5}{8}$ (3) $\frac{3}{4}$ (4) $\frac{9}{16}$

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Q.7 Let $f(x) = \begin{cases} \frac{ax^2 + 2ax + 3}{4x^2 + 4x - 3}, & x \neq -\frac{3}{2}, \frac{1}{2} \\ b, & x = -\frac{3}{2}, \frac{1}{2} \end{cases}$ be continuous at $x = -\frac{3}{2}$. If $f \circ f(x) = \frac{7}{5}$, then x is equal to :

- [JEE Main 2026 (Online) 23rd January Morning Shift]
- (1) 1.4 (2) 2 (3) 1 (4) 0

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Q.8 If $f(x) = \begin{cases} \frac{a|x| + x^2 - 2(\sin|x|)(\cos|x|)}{x}, & x \neq 0 \\ b, & x = 0 \end{cases}$ is continuous at $x = 0$, then $a + b$ is equal to :

- [JEE Main 2026 (Online) 23rd January Evening Shift]
- (1) 1 (2) 2 (3) 0 (4) 4

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- Q.9** Let $[\cdot]$ denote the greatest integer function, and let $f(x) = \min \{ \sqrt{2}x, x^2 \}$. Let $S = \{x \in (-2, 2) : \text{the function } g(x) = |x|[\sqrt{x^2}] \text{ is discontinuous at } x\}$. Then $\sum_{x \in S} f(x)$ equals

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

- (1) $2 - \sqrt{2}$ (2) $2\sqrt{6} - 3\sqrt{2}$
 (3) $1 - \sqrt{2}$ (4) $\sqrt{6} - 2\sqrt{2}$

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- Q.10** Let $f(x) = \begin{cases} (1+ax)^{1/x}, & x < 0 \\ 1 + \frac{1}{2}x, & 0 \leq x < 1 \\ \frac{1}{2}x + 1, & x \geq 1 \end{cases}$ be continuous at $x = 0$. Then a is equal to:

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

- (1) 64 (2) 48 (3) 36 (4) 72

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Section B (Numerical) — 8 questions

- Q.11** Let $f(x) = \begin{cases} x^3 + 8, & x < 0 \\ 2x - 4, & 0 \leq x < 2 \\ x^2 - 4, & x \geq 2 \end{cases}$ and $g(x) = \begin{cases} (x-8)^{1/3}, & x < 0 \\ (x+4)^{1/2}, & 0 \leq x < 4 \\ x, & x \geq 4 \end{cases}$. Then the number of points, where the function $g \circ f$ is discontinuous, is _____.

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

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- Q.12** The number of points, at which the function $f(x) = \max \{ 6x, 2 + 3x^2 \} + |x - 1| \cos \left| x^2 - \frac{1}{4} \right|$, $x \in (-\pi, \pi)$, is not differentiable, is _____.

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

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- Q.13** Let $f(x) = \begin{cases} e^x - 1, & x < 0 \\ 2x - 5, & 0 \leq x < 6 \end{cases}$ and $g(x) = f(|x|) + |f(x)|$. If the number of points where g is not continuous and is not differentiable are α and β respectively, then $\alpha + \beta$ is equal to _____.

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

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- Q.14** The number of points in the interval $[2, 4]$, at which the function $f(x) = \left[x^2 - x - \frac{1}{2} \right]$, where $[\cdot]$ denotes the greatest integer function, is discontinuous, is _____.

[JEE Main 2026 (Online) 2nd April Evening Shift]

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- Q.15** The number of points of discontinuity of the function $f(x) = \left[\frac{x^2}{2} \right] - [\sqrt{x}]$, $x \in [0, 4]$, where $[\cdot]$ denotes the greatest integer function, is _____.

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

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- Q.16** If the function $f(x) = \frac{\tan(\tan x) - \sin(\sin x)}{\tan x - \sin x}$ is continuous at $x = 0$, then $f(0)$ is equal to _____.

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

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- Q.17** Let m and n be the number of points at which the function $f(x) = \max \{ x, x^3, x^5, \dots, x^{21} \}$, $x \in \mathbb{R}$, is not differentiable and not continuous, respectively. Then $m + n$ is equal to _____.

[JEE Main 2025 (Online) 4th April Morning Shift]

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- Q.18** Let $f(x) = \begin{cases} 3x, & x < 0 \\ \min \{ 1 + x, [x] \}, & 0 \leq x < 2 \\ 5x, & x \geq 2 \end{cases}$ where $[\cdot]$ denotes greatest integer function. If α and β are the number of points, where f is not continuous and is not differentiable, respectively, then $\alpha + \beta$ equals _____.

[JEE Main 2025 (Online) 28th January Morning Shift]

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ANSWER KEY

Section A (MCQ) — 10 questions

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

Section B (Numerical) — 8 questions

Ques.	11	12	13	14	15	16	17	18		
Ans.	3	3	4	10	8	2	3	5		