

Q1. JEE Main 2026 (23 January Shift 1)

$$\text{Let } f(x) = \begin{cases} \frac{ax^2+2ax+3}{4x^2+4x-3}, & x \neq -\frac{3}{2}, \frac{1}{2} \\ b, & x = -\frac{3}{2}, \frac{1}{2} \end{cases}$$

be continuous at $x = -\frac{3}{2}$. If $f \circ f(x) = \frac{7}{5}$, then x is equal to:

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

Q2. JEE Main 2026 (24 January Shift 2)

Let $[t]$ denote the greatest integer less than or equal to t . If the function

$$f(x) = \begin{cases} b^2 \sin\left(\frac{\pi}{2}\left[\frac{\pi}{2}(\cos x + \sin x) \cos x\right]\right), & x < 0 \\ \frac{\sin x - \frac{1}{2} \sin 2x}{x^3}, & x > 0 \\ a, & x = 0 \end{cases}$$

is continuous at $x = 0$, then $a^2 + b^2$ is equal to

- (1) $\frac{5}{8}$ (2) $\frac{1}{2}$ (3) $\frac{9}{16}$ (4) $\frac{3}{4}$

Q3. JEE Main 2026 (22 January Shift 2)

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

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

Q4. JEE Main 2026 (23 January Shift 2)

$$\text{If } f(x) = \begin{cases} \frac{a|x|+x^2-2(\sin|x|)(\cos|x|)}{x}, & x \neq 0 \\ b, & x = 0 \end{cases}$$

is continuous at $x = 0$, then $a + b$ is equal to

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

Q5. JEE Main 2026 (24 January Shift 1)

If the function $f(x) = \frac{e^x(e^{\tan x - x} - 1) + \log_e(\sec x + \tan x) - x}{\tan x - x}$ is continuous at $x = 0$, then the value of $f(0)$ is equal to

- (1) $\frac{2}{3}$ (2) 2 (3) $\frac{3}{2}$ (4) $\frac{1}{2}$

Q6. JEE Main 2026 (24 January Shift 1)

$$\text{Let } \alpha, \beta \in \mathbb{R} \text{ be such that the function } f(x) = \begin{cases} 2\alpha(x^2 - 2) + 2\beta x, & x < 1 \\ (\alpha + 3)x + (\alpha - \beta), & x \geq 1 \end{cases}$$

be differentiable at all $x \in \mathbb{R}$. Then $34(\alpha + \beta)$ is equal to

- (1) 36 (2) 24 (3) 84 (4) 48

ANSWERS AND SOLUTIONS

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

1. (4) $4x^2 + 4x - 3 = (2x + 3)(2x - 1)$. For continuity at $x = -3/2$, numerator must vanish there:

$$a(9/4) - 3a + 3 = 0 \Rightarrow a = 4.$$

$$f(x) = \frac{(2x+1)(2x+3)}{(2x+3)(2x-1)} = \frac{2x+1}{2x-1} \text{ for } x \neq -3/2.$$

$$f \circ f(x) = f\left(\frac{2x+1}{2x-1}\right) = \frac{6x+1}{2x+3}.$$

$$\frac{6x+1}{2x+3} = \frac{7}{5} \Rightarrow 30x + 5 = 14x + 21 \Rightarrow x = 1.$$

2. (4) For $x > 0$: $\sin x - \frac{1}{2}\sin 2x = \sin x(1 - \cos x)$.

$$\lim_{x \rightarrow 0^+} \frac{\sin x(1 - \cos x)}{x^3} = \lim_{x \rightarrow 0^+} \frac{\sin x}{x} \cdot \frac{1 - \cos x}{x^2} = 1 \cdot \frac{1}{2} = \frac{1}{2}.$$

$$\text{So } a = \frac{1}{2}.$$

For $x < 0$ near 0: $\frac{\pi}{2}(\cos x + \sin x) \cos x \rightarrow \frac{\pi}{2}$ from below, so $\left[\frac{\pi}{2}(\cos x + \sin x) \cos x\right] = 1$.

$$f(x) = b^2 \sin\left(\frac{\pi}{2} \cdot 1\right) = b^2.$$

For continuity: $b^2 = a = \frac{1}{2}$.

$$a^2 + b^2 = \frac{1}{4} + \frac{1}{2} = \frac{3}{4}.$$

3. (2) $g(x) = |x| [x^2]$

Points of discontinuity of $g(x)$ in $(-2, 2)$ are

$$(\pm 1, \pm\sqrt{2}, \pm\sqrt{3})$$

$$\therefore S = \{-1, 1, -\sqrt{2}, \sqrt{2}, -\sqrt{3}, \sqrt{3}\}$$

$$\therefore f(x) = \min\{\sqrt{2}x, x^2\}$$

$$\therefore \sum_{x \in S} f(x) = -\sqrt{2} + 1 - 2 + 2 - \sqrt{6} + \sqrt{6} = 1 - \sqrt{2}$$

4. (3) Note $2 \sin |x| \cos |x| = \sin(2|x|)$.

$$\text{For } x > 0: f(x) = a + x - \frac{\sin 2x}{x} \xrightarrow{x \rightarrow 0^+} a - 2.$$

$$\text{For } x < 0: f(x) = -a + x + \frac{\sin 2x}{x} \xrightarrow{x \rightarrow 0^-} -a + 2.$$

For continuity: $a - 2 = 2 - a \Rightarrow a = 2$, and $b = a - 2 = 0$.

$$a + b = 2.$$

5. (3) $f(0) = \lim_{x \rightarrow 0} \frac{e^{\tan x} - e^x + \ln(\sec x + \tan x) - x}{\tan x - x}$

Applying L'hospital rule

$$\Rightarrow f(0) = \lim_{x \rightarrow 0} \frac{e^{\tan x} \cdot \sec^2 x - e^x + \sec x - 1}{\sec^2 x - 1}$$

$$\Rightarrow f(0) = \lim_{x \rightarrow 0} \frac{e^{\tan x}(\sec^2 x - 1) + (e^{\tan x} - e^x) + \sec x - 1}{\tan^2 x}$$

$$\Rightarrow f(0) = \lim_{x \rightarrow 0} \left(e^{\tan x} + \frac{e^x (e^{\tan x - x} - 1)}{\tan^2 x} + \frac{1}{\sec x + 1} \right)$$

$$\Rightarrow f(0) = 1 + 0 + \frac{1}{2} = \frac{3}{2}$$

$$6. (4) f(x) = \begin{cases} 2\alpha x^2 + 2\beta x - 4\alpha & ; x < 1 \\ (\alpha + 3)x + \alpha - \beta & ; x \geq 1 \end{cases}$$

$$f(1^-) = 2\alpha - \beta + 3, f(1) = -2\alpha + 2\beta$$

$$2\alpha - \beta + 3 = 2\beta - 2\alpha \Rightarrow 4\alpha - 3\beta + 3 = 0 \dots(1)$$

$$f'(1^+) = 4\alpha + 2\beta, f'(1^-) = \alpha + 3$$

$$4\alpha + 2\beta = \alpha + 3 \Rightarrow 3\alpha + 2\beta - 3 = 0 \dots(2)$$

Solving (1) & (2)

$$\text{We get } \alpha = \frac{3}{17}, \beta = \frac{21}{17}$$

$$\Rightarrow 34(\alpha + \beta) = 34 \times \frac{27}{17} = 48$$