

PYQSide

JEE MAIN LIMITS AND DERIVATIVES — LIMITS USING SERIES EXPANSIONS AND L'HÔPITAL'S RULE (JEE) — PYQS

Max. Marks: 40

Questions: 10

Section A (MCQ)

Q.1 The value of $\lim_{x \rightarrow 0} \left(\frac{x^2 \sin^2 x}{x^2 - \sin^2 x} \right)$ is :

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

- (1) 2 (2) 3 (3) 4 (4) 6

Scan or tap for the full solution



Q.2 The value of

$$\lim_{x \rightarrow 0} \frac{\log_e (\sec(ex) \cdot \sec(e^2x) \cdot \dots \cdot \sec(e^{10}x))}{e^2 - e^{2\cos x}}$$

is equal to

[JEE Main 2026 (Online) 28th January Morning Shift]

- (1) $\frac{(e^{10} - 1)}{2e^2(e^2 - 1)}$ (2) $\frac{(e^{20} - 1)}{2e^2(e^2 - 1)}$
 (3) $\frac{(e^{10} - 1)}{2(e^2 - 1)}$ (4) $\frac{(e^{20} - 1)}{2(e^2 - 1)}$

Scan or tap for the full solution



Q.3 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

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

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

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Q.4 If $\lim_{x \rightarrow 0} \frac{e^{(a-1)x} + 2\cos bx + (c-2)e^{-x}}{x\cos x - \log_e(1+x)} = 2$, then

 $a^2 + b^2 + c^2$ is equal to :

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

- (1) 3 (2) 5 (3) 9 (4) 7

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Q.5 Let $f: \mathbb{R} \rightarrow (0, \infty)$ be a twice differentiable function such that $f(3) = 18$, $f'(3) = 0$ and $f''(3) = 4$.

Then $\lim_{x \rightarrow 1} \log_e \left(\frac{f(2+x)}{f(3)} \right)^{\frac{18}{(x-1)^2}}$ is equal to :

[JEE Main 2026 (Online) 21st January Morning Shift]

- (1) 9 (2) 18 (3) 1 (4) 2

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Q.6 Given below are two statements:

Statement-I:

$$\lim_{x \rightarrow 0} \left(\frac{\tan^{-1} x + \log_e \sqrt{\frac{1+x}{1-x}} - 2x}{x^5} \right) = \frac{2}{5}$$

Statement-II: $\lim_{x \rightarrow 1} \left(\frac{x^{\frac{2}{1-x}}}{e^2} \right) = \frac{1}{e^2}$

In the light of the above statements, choose the **correct** answer from the options given below:

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

- (1) Statement-I is false but Statement-II is true
 (2) Both Statement-I and Statement-II are false
 (3) Both Statement-I and Statement-II are true
 (4) Statement-I is true but Statement-II is false

Scan or tap for the full solution



Q.7 If $\lim_{x \rightarrow 1^+} \frac{(x-1)(6 + \lambda \cos(x-1)) + \mu \sin(1-x)}{(x-1)^3} = -1$,

where $\lambda, \mu \in \mathbb{R}$, then $\lambda + \mu$ is equal to

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

- (1) 20 (2) 19 (3) 18 (4) 17

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Q.8 For $\alpha, \beta, \gamma \in \mathbb{R}$, if $\lim_{x \rightarrow 0} \frac{x^2 \sin \alpha x + (\gamma - 1)e^{x^2}}{\sin 2x - \beta x} = 3$,

then $\beta + \gamma - \alpha$ is equal to :

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

- (1) -1 (2) 4 (3) 6 (4) 7

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Q.9 If $\lim_{x \rightarrow 0} \frac{\cos(2x) + a \cos(4x) - b}{x^4}$ is finite, then $(a + b)$ is equal to:

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

- (1) 0 (2) $\frac{3}{4}$ (3) -1 (4) $\frac{1}{2}$

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Section B (Numerical)

Q.10 If $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x} \right)^{\frac{1}{x^2}} = p$, then $96 \log_e p$ is equal to

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

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full solution



ANSWER KEY

Section A (MCQ)

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

Section B (Numerical)

Ques.	10										
Ans.	32										