

PYQSide

JEE MAIN APPLICATION OF DERIVATIVES — MAXIMA AND MINIMA: FIRST AND SECOND DERIVATIVE TESTS — PYQS

Max. Marks: 40

Questions: 10

Section A (MCQ)

- Q.1** Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a differentiable function such that $f\left(\frac{x+y}{3}\right) = \frac{f(x)+f(y)}{3}$ for all $x, y \in \mathbb{R}$, and $f(0) = 3$. Then the minimum value of the function $g(x) = 3 + e^x f(x)$, is:

[JEE Main 2026 (Online) 5th April Morning Shift]

- (1) $3\left(\frac{e+1}{e}\right)$ (2) $3\left(\frac{e-1}{e}\right)$
(3) $\frac{3-e}{e}$ (4) $3e$

Scan or tap for the full solution



- Q.2** The number of critical points of the function $f(x) = \begin{cases} \left| \frac{\sin x}{x} \right|, & x \neq 0 \\ 1, & x = 0 \end{cases}$ in the interval $(-2\pi, 2\pi)$ is equal to:

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

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

Scan or tap for the full solution



- Q.3** Let $f(x)$ be a polynomial of degree 5, and have extrema at $x = 1$ and $x = -1$. If $\lim_{x \rightarrow 0} \left(\frac{f(x)}{x^3} \right) = -5$, then $f(2) - f(-2)$ is equal to:

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

- (1) 0 (2) 50 (3) 92 (4) 112

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- Q.4** Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a polynomial function of degree four having extreme values at $x = 4$ and $x = 5$. If $\lim_{x \rightarrow 0} \frac{f(x)}{x^2} = 5$, then $f(2)$ is equal to:

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

- (1) 8 (2) 10 (3) 12 (4) 14

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- Q.5** Let $a > 0$. If the function $f(x) = 6x^3 - 45ax^2 + 108a^2x + 1$ attains its local maximum and minimum values at the points x_1 and x_2 respectively such that $x_1x_2 = 54$, then $a + x_1 + x_2$ is equal to:

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

- (1) 15 (2) 13 (3) 24 (4) 18

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- Q.6** Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a function defined by $f(x) = ||x+2| - 2|x||$. If m is the number of points of local minima and n is the number of points of local maxima of f , then $m + n$ is

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

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

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- Q.7** If the function $f(x) = 2x^3 - 9ax^2 + 12a^2x + 1$, where $a > 0$, attains its local maximum and local minimum values at p and q , respectively, such that $p^2 = q$, then $f(3)$ is equal to:

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

- (1) 55 (2) 37 (3) 10 (4) 23

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- Q.8** The sum of all local minimum values of the function $f(x) = \begin{cases} 1 - 2x, & x < -1 \\ \frac{1}{3}(7 + 2\ln x), & -1 \leq x \leq 2 \\ \frac{1}{118}(\ln x - 4)(\ln x - 5), & \ln x > 2 \end{cases}$ is

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

- (1) $\frac{167}{72}$ (2) $\frac{157}{72}$ (3) $\frac{171}{72}$ (4) $\frac{131}{72}$

Scan or tap for the full solution



Section B (Numerical)

- Q.9** Let f be a differentiable function satisfying $f(x) = 1 - 2x + \int_0^x e^{(x-t)} f(t) dt$, $x \in \mathbb{R}$ and let $g(x) = \int_0^x (f(t) + 2)^{15} (t-4)^6 (t+12)^{17} dt$, $x \in \mathbb{R}$. If p and q are respectively the points of local minima and local maxima of g , then the value of $|p + q|$ is equal to _____.

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

Scan or tap for the full solution



Q.10 Let $(2\alpha, \alpha)$ be the largest interval in which the function $f(t) = \frac{|t+1|}{t^2}$, $t < 0$, is strictly decreasing. Then the local maximum value of the function $g(x) = 2\log_e(x-2) + \alpha x^2 + 4x - \alpha$, $x > 2$, is _____

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

Scan or tap for the
full solution



ANSWER KEY

Section A (MCQ)

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

Section B (Numerical)

Ques.	9	10									
Ans.	9	4									