

PART 1 - MATHEMATICS

Topic : Differential equations

SECTION-A : (Maximum Marks : 12)

This section contains **THREE** questions.

Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).

For each question, choose the option(s) corresponding to (all) the correct answer(s).

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 ONLY if (all) the correct option(s) is(are) chosen;

Partial Marks : +3 If all the four options are correct but ONLY three options are chosen;

Partial Marks : +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;

Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases.

For example, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -1 marks.

1. Let $y : (-\infty, \infty) \rightarrow (0, \infty)$ be the solution of the differential equation

$$\frac{dy}{dx} = \frac{e^{5x}y^3 + y^3}{e^x + e^xy^4},$$

satisfying $y(0) = \frac{1}{\sqrt{2}}$. Then the value of $y(\log_e 2)$ is

[JEE Advanced 2026 Paper 2]

- (A) $\sqrt{\frac{5 + \sqrt{35}}{2}}$ (B) $\sqrt{\frac{7 + \sqrt{53}}{2}}$ (C) $\frac{7 + \sqrt{53}}{2}$ (D) $\frac{5 + \sqrt{35}}{2}$

Scan or tap for the
full solution



2. Let $y = f(x)$ be the real valued function defined on the interval $(0, \infty)$, satisfying $y(1) = 0$ and the differential equation

$$x \frac{dy}{dx} = y - x^3.$$

Then which of the following statements is (are) TRUE ?

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Space for Rough Work

(A) The function f has a local minimum at $x = \frac{1}{\sqrt{3}}$

(B) The function f has a local maximum at $x = \frac{1}{\sqrt{3}}$

(C) The function f is increasing in the interval $(1, 2)$

(D) If $g(x) = 4x^3 - 5x^2 + \frac{3}{2}x$ for $x > 0$, then the number of elements in the set $\{x \in (0, \infty) : f(x) = g(x)\}$ is 2

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3. Let $f(x)$ be a continuously differentiable function on the interval $(0, \infty)$ such that $f(1) = 2$ and

$$\lim_{t \rightarrow x} \frac{t^{10}f(x) - x^{10}f(t)}{t^9 - x^9} = 1$$

for each $x > 0$. Then, for all $x > 0$, $f(x)$ is equal to

[JEE Advanced 2024 Paper 1]

(A) $\frac{31}{11x} - \frac{9}{11}x^{10}$

(B) $\frac{9}{11x} + \frac{13}{11}x^{10}$

(C) $\frac{-9}{11x} + \frac{31}{11}x^{10}$

(D) $\frac{13}{11x} + \frac{9}{11}x^{10}$

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SECTION-B : (Maximum Marks : 8)

This section contains **TWO** questions.

The answer to each question is a **NUMERICAL VALUE**.

For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) in the place designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If **ONLY** the correct answer is entered;

Zero Marks : 0 In all other cases.

4. For all $x > 0$, let $y_1(x)$, $y_2(x)$, and $y_3(x)$ be the functions satisfying

$$\frac{dy_1}{dx} - (\sin x)^2 y_1 = 0, \quad y_1(1) = 5,$$

$$\frac{dy_2}{dx} - (\cos x)^2 y_2 = 0, \quad y_2(1) = \frac{1}{3},$$

$$\frac{dy_3}{dx} - \left(\frac{2-x^3}{x^3} \right) y_3 = 0, \quad y_3(1) = \frac{3}{5e},$$

respectively. Then

$$\lim_{x \rightarrow 0^+} \frac{y_1(x)y_2(x)y_3(x) + 2x}{e^{3x}\sin x}$$

is equal to _____.

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5. Let $y(x)$ be the solution of the differential equation

$$x^2 \frac{dy}{dx} + xy = x^2 + y^2, \quad x > \frac{1}{e},$$

satisfying $y(1) = 0$. Then the value of $2 \frac{(y(e))^2}{y(e^2)}$ is _____.

[JEE Advanced 2025 Paper 2]

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JEE ADVANCED DIFFERENTIAL EQUATIONS — PYQS

Test Pattern : JEE (Advanced)

ANSWER KEY

SECTION-A																								
Ques.	1	2	3																					
Ans.	B	B, D	B																					

SECTION-B														
Ques.	4	5												
Ans.	2	0.7 to 0.8												