

JEE MAIN DIFFERENTIAL EQUATIONS — HOMOGENEOUS DIFFERENTIAL EQUATIONS — PYQS

Max. Marks: 36

Questions: 9

Section A (MCQ) — 6 questions

1. Let $x = x(y)$ be the solution of the differential equation $2y^2 \frac{dx}{dy} - 2xy + x^2 = 0$, $y > 1$, $x(e) = e$.

Then $x(e^2)$ is equal to:

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

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

Scan or tap for the full solution



2. Let the solution curve of the differential equation $x dy - y dx = \sqrt{x^2 + y^2} dx$, $x > 0$, $y(1) = 0$, be $y = y(x)$. Then $y(3)$ is equal to

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

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

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3. Let $x = x(y)$ be the solution of the differential equation $y = \left(x - y \frac{dx}{dy}\right) \sin\left(\frac{x}{y}\right)$, $y > 0$ and $x(1) = \frac{\pi}{2}$. Then $\cos(x(2))$ is equal to :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) $2(\log_e 2) - 1$ (2) $1 - 2(\log_e 2)^2$
(3) $1 - 2(\log_e 2)$ (4) $2(\log_e 2)^2 - 1$

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4. The solution of the differential equation $(x^2 + y^2)dx - 5xy dy = 0$, $y(1) = 0$, is :

[JEE Main 2024 (Online) 9th April Morning Shift]

- (1) $|x^2 - 4y^2|^5 = x^2$ (2) $|x^2 - 2y^2|^6 = x$
(3) $|x^2 - 2y^2|^5 = x^2$ (4) $|x^2 - 4y^2|^6 = x$

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5. The solution curve of the differential equation $y \frac{dx}{dy} = x(\log_e x - \log_e y + 1)$, $x > 0$, $y > 0$ passing through the point $(e, 1)$ is

[JEE Main 2024 (Online) 31st January Morning Shift]

(1) $\left| \log_e \frac{y}{x} \right| = y^2$

(2) $\left| \log_e \frac{y}{x} \right| = x$

(3) $\left| \log_e \frac{x}{y} \right| = y$

(4) $2 \left| \log_e \frac{x}{y} \right| = y + 1$

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6. If $\sin\left(\frac{y}{x}\right) = \log_e |x| + \frac{\alpha}{2}$ is the solution of the differential equation $x \cos\left(\frac{y}{x}\right) \frac{dy}{dx} = y \cos\left(\frac{y}{x}\right) + x$ and $y(1) = \frac{\pi}{3}$, then α^2 is equal to

[JEE Main 2024 (Online) 29th January Evening Shift]

- (1) 12 (2) 9 (3) 4 (4) 3

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Section B (Numerical) — 3 questions

7. Let $y = y(x)$ be the solution of the differential equation $x \sin\left(\frac{y}{x}\right) dy = \left(y \sin\left(\frac{y}{x}\right) - x\right) dx$, $y(1) = \frac{\pi}{2}$ and let $\alpha = \cos\left(\frac{y(e^{12})}{e^{12}}\right)$. Then the number of integral values of p , for which the equation $x^2 + y^2 - 2px + 2py + \alpha + 2 = 0$ represents a circle of radius $r \leq 6$, is _____.

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

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8. Let $f(x) = \sqrt{\lim_{r \rightarrow x} \left\{ \frac{2r^2[(f(r))^2 - f(x)f(r)]}{r^2 - x^2} - r^3 e^{\frac{f(r)}{r}} \right\}}$ be differentiable in $(-\infty, 0) \cup (0, \infty)$ and $f(1) = 1$. Then the value of ea , such that $f(a) = 0$, is equal to _____.

[JEE Main 2024 (Online) 29th January Evening Shift]

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9. If the solution curve, of the differential equation $\frac{dy}{dx} = \frac{x + y - 2}{x - y}$ passing through the point $(2, 1)$ is $\tan^{-1}\left(\frac{y-1}{x-1}\right) - \frac{1}{\beta} \log_e \left(\alpha + \left(\frac{y-1}{x-1}\right)^2 \right) = \log_e |x-1|$, then $5\beta + \alpha$ is equal to _____.

[JEE Main 2024 (Online) 27th January Evening Shift]

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full solution



ANSWER KEY

Section A (MCQ) — 6 questions

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

Section B (Numerical) — 3 questions

Ques.	7	8	9								
Ans.	6	2	11								