

MATHEMATICS · JEE MAIN

Differential Equations

Chapter-wise previous year questions, with answer key

174

PYQS

2020–2025

PAPERS

4

TOPICS

Order and Degree

Variable Separable Method

Linear Differential Equations

Homogeneous Equations

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

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Order and Degree · 4 PYQs

Q1 JEE Main 2024 · 8 Apr · Shift 1

Let $f(x)$ be a positive function such that the area bounded by $y = f(x)$, $y = 0$ from $x = 0$ to $x = a > 0$ is $e^{-a} + 4a^2 + a - 1$. Then the differential equation, whose general solution is $y = c_1 f(x) + c_2$, where c_1 and c_2 are arbitrary constants, is

- (A) $(8e^x + 1) \frac{d^2 y}{dx^2} - \frac{dy}{dx} = 0$
- (B) $(8e^x + 1) \frac{d^2 y}{dx^2} + \frac{dy}{dx} = 0$
- (C) $(8e^x - 1) \frac{d^2 y}{dx^2} - \frac{dy}{dx} = 0$
- (D) $(8e^x - 1) \frac{d^2 y}{dx^2} + \frac{dy}{dx} = 0$

[Step-by-step solution ► prepwiser.in/questions/FqI1wPW7ud](https://www.prepwiser.in/questions/FqI1wPW7ud)

Q2 JEE Main 2021 · 27 Aug · Shift 2

A differential equation representing the family of parabolas with axis parallel to y-axis and whose length of latus rectum is the distance of the point $(2, -3)$ from the line $3x + 4y = 5$, is given by :

- (A) $10 \frac{d^2 y}{dx^2} = 11$
- (B) $11 \frac{d^2 x}{dy^2} = 10$
- (C) $10 \frac{d^2 x}{dy^2} = 11$
- (D) $11 \frac{d^2 y}{dx^2} = 10$

[Step-by-step solution ► prepwiser.in/questions/AqPiC8KXQj](https://www.prepwiser.in/questions/AqPiC8KXQj)

Q3 JEE Main 2021 · 26 Feb · Shift 1

The difference between degree and order of a differential equation that represents the family of curves given by $y^2 = a \left(x + \frac{\sqrt{a}}{2} \right)$, $a > 0$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/8wLR01aVN1](https://www.prepwiser.in/questions/8wLR01aVN1)

Q4 JEE Main 2020 · 8 Jan · Shift 2

The differential equation of the family of curves, $x^2 = 4b(y + b)$, $b \in \mathbb{R}$, is :

- (A) $x(y')^2 = x - 2yy'$
- (B) $x(y')^2 = 2yy' - x$
- (C) $xy'' = y'$
- (D) $x(y')^2 = x + 2yy'$

[Step-by-step solution ► prepwiser.in/questions/Ad3b962-E1](https://www.prepwiser.in/questions/Ad3b962-E1)

Variable Separable Method · 58 PYQs

Q5 JEE Main 2025 · 24 Jan · Shift 1

Let $y = y(x)$ be the solution of the differential equation $(xy - 5x^2\sqrt{1+x^2}) dx + (1+x^2) dy = 0$, $y(0) = 0$. Then $y(\sqrt{3})$ is equal to

- (A) $\frac{5\sqrt{3}}{2}$
- (B) $\sqrt{\frac{15}{2}}$
- (C) $\sqrt{\frac{14}{3}}$
- (D) $2\sqrt{2}$

[Step-by-step solution ► prepwiser.in/questions/U4FSwNd3jO](https://www.prepwiser.in/questions/U4FSwNd3jO)

Q6 JEE Main 2025 · 23 Jan · Shift 2

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 :

- (A) $2(\log_e 2) - 1$ (B) $1 - 2(\log_e 2)^2$
(C) $1 - 2(\log_e 2)$ (D) $2(\log_e 2)^2 - 1$

[Step-by-step solution ► prepwiser.in/questions/mJRBhOXyKm](https://www.prepwiser.in/questions/mJRBhOXyKm)

Q7 JEE Main 2025 · 23 Jan · Shift 1

Let a curve $y = f(x)$ pass through the points $(0, 5)$ and $(\log_e 2, k)$. If the curve satisfies the differential equation $2(3 + y)e^{2x} dx - (7 + e^{2x}) dy = 0$, then k is equal to

- (A) 32 (B) 8
(C) 4 (D) 16

[Step-by-step solution ► prepwiser.in/questions/k-QtsYNLLO](https://www.prepwiser.in/questions/k-QtsYNLLO)

Q8 JEE Main 2024 · 9 Apr · Shift 1

The solution curve, of the differential equation $2y \frac{dy}{dx} + 3 = 5 \frac{dy}{dx}$, passing through the point $(0, 1)$ is a conic, whose vertex lies on the line :

- (A) $2x + 3y = -9$ (B) $2x + 3y = -6$
(C) $2x + 3y = 9$ (D) $2x + 3y = 6$

[Step-by-step solution ► prepwiser.in/questions/UZI5-wYOTp](https://www.prepwiser.in/questions/UZI5-wYOTp)

Q9 JEE Main 2024 · 8 Apr · Shift 1

Let $y = y(x)$ be the solution of the differential equation $(1 + y^2)e^{\tan x} dx + \cos^2 x(1 + e^{2 \tan x}) dy = 0$, $y(0) = 1$. Then $y\left(\frac{\pi}{4}\right)$ is equal to

- (A) $\frac{1}{e^2}$ (B) $\frac{2}{e^2}$
(C) $\frac{2}{e}$ (D) $\frac{1}{e}$

[Step-by-step solution ► prepwiser.in/questions/jyHOH0bm44](https://www.prepwiser.in/questions/jyHOH0bm44)

Q10 JEE Main 2024 · 8 Apr · Shift 2

Let $\alpha|x| = |y|e^{xy-\beta}$, $\alpha, \beta \in \mathbf{N}$ be the solution of the differential equation $x dy - y dx + xy(x dy + y dx) = 0$, $y(1) = 2$. Then $\alpha + \beta$ is equal to _____

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/GcHjhb77tM](https://www.prepwiser.in/questions/GcHjhb77tM)

Q11 JEE Main 2024 · 6 Apr · Shift 2

If the solution $y(x)$ of the given differential equation $(e^y + 1) \cos x dx + e^y \sin x dy = 0$ passes through the point $\left(\frac{\pi}{2}, 0\right)$, then the value of $e^{y\left(\frac{\pi}{6}\right)}$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/HH89hd1L2T](https://www.prepwiser.in/questions/HH89hd1L2T)

Q12 JEE Main 2024 · 4 Apr · Shift 2

Let $y = y(x)$ be the solution of the differential equation $(x + y + 2)^2 dx = dy$, $y(0) = -2$. Let the maximum and minimum values of the function $y = y(x)$ in $[0, \frac{\pi}{3}]$ be α and β , respectively. If $(3\alpha + \pi)^2 + \beta^2 = \gamma + \delta\sqrt{3}$, $\gamma, \delta \in \mathbb{Z}$, then $\gamma + \delta$ equals _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/0HA6oWYRN4](https://www.prepwiser.in/questions/0HA6oWYRN4)

Q13 JEE Main 2024 · 4 Apr · Shift 1

If the solution $y = y(x)$ of the differential equation $(x^4 + 2x^3 + 3x^2 + 2x + 2)dy - (2x^2 + 2x + 3)dx = 0$ satisfies $y(-1) = -\frac{\pi}{4}$, then $y(0)$ is equal to :

(A) $-\frac{\pi}{12}$

(B) $\frac{\pi}{2}$

(C) 0

(D) $\frac{\pi}{4}$

[Step-by-step solution ► prepwiser.in/questions/DOQ1Mm3ZX4](https://www.prepwiser.in/questions/DOQ1Mm3ZX4)

Q14 JEE Main 2024 · 1 Feb · Shift 1

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

$$\frac{dy}{dx} = 2x(x + y)^3 - x(x + y) - 1, y(0) = 1.$$

Then, $\left(\frac{1}{\sqrt{2}} + y\left(\frac{1}{\sqrt{2}}\right)\right)^2$ equals :

(A) $\frac{4}{4+\sqrt{e}}$

(B) $\frac{3}{3-\sqrt{e}}$

(C) $\frac{2}{1+\sqrt{e}}$

(D) $\frac{1}{2-\sqrt{e}}$

[Step-by-step solution ► prepwiser.in/questions/AnKsIRi5Z7](https://www.prepwiser.in/questions/AnKsIRi5Z7)

Q15 JEE Main 2024 · 1 Feb · Shift 1

If $x = x(t)$ is the solution of the differential equation $(t + 1)dx = (2x + (t + 1)^4) dt$, $x(0) = 2$, then, $x(1)$ equals _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/aKf1bcuisW](https://www.prepwiser.in/questions/aKf1bcuisW)

Q16 JEE Main 2024 · 31 Jan · Shift 2

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

$$\sec^2 x dx + (e^{2y} \tan^2 x + \tan x) dy = 0, 0 < x < \frac{\pi}{2}, y(\pi/4) = 0$$

.

If $y(\pi/6) = \alpha$, then $e^{8\alpha}$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/H_04syS5hZ](https://www.prepwiser.in/questions/H_04syS5hZ)

Q17 JEE Main 2024 · 31 Jan · Shift 2

The temperature $T(t)$ of a body at time $t = 0$ is 160°F and it decreases continuously as per the differential equation $\frac{dT}{dt} = -K(T - 80)$, where K is a positive constant. If $T(15) = 120^\circ\text{F}$, then $T(45)$ is equal to

- (A) 90°F (B) 85°F
(C) 80°F (D) 95°F

[Step-by-step solution ► prepwiser.in/questions/uQ1JOUI8-X](https://www.prepwiser.in/questions/uQ1JOUI8-X)

Q18 JEE Main 2024 · 29 Jan · Shift 1

If the solution curve $y = y(x)$ of the differential equation $(1 + y^2)(1 + \log_e x) dx + x dy = 0$, $x > 0$ passes through the point $(1, 1)$ and

$$y(e) = \frac{\alpha - \tan\left(\frac{3}{2}\right)}{\beta + \tan\left(\frac{3}{2}\right)}$$

, then $\alpha + 2\beta$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/FRfz7kP9J8](https://www.prepwiser.in/questions/FRfz7kP9J8)

Q19 JEE Main 2024 · 27 Jan · Shift 1

If the solution of the differential equation

$$(2x + 3y - 2)dx + (4x + 6y - 7)dy = 0, y(0) = 3, \text{ is}$$

$\alpha x + \beta y + 3 \log_e |2x + 3y - \gamma| = 6$, then $\alpha + 2\beta + 3\gamma$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/nlpkwI1t79](https://www.prepwiser.in/questions/nlpkwI1t79)

Q20 JEE Main 2024 · 27 Jan · Shift 2

If $y = y(x)$ is the solution curve of the differential equation

$$(x^2 - 4) dy - (y^2 - 3y) dx = 0, x > 2, y(4) = \frac{3}{2}$$

and the slope of the curve is never zero, then the value of $y(10)$ equals :

- (A) $\frac{3}{1+(8)^{1/4}}$ (B) $\frac{3}{1-(8)^{1/4}}$
(C) $\frac{3}{1-2\sqrt{2}}$ (D) $\frac{3}{1+2\sqrt{2}}$

[Step-by-step solution ► prepwiser.in/questions/qRuOQj8xXF](https://www.prepwiser.in/questions/qRuOQj8xXF)

Q21 JEE Main 2023 · 13 Apr · Shift 1

Let $y = y_1(x)$ and $y = y_2(x)$ be the solution curves of the differential equation $\frac{dy}{dx} = y + 7$ with initial conditions $y_1(0) = 0$ and $y_2(0) = 1$ respectively. Then the curves $y = y_1(x)$ and $y = y_2(x)$ intersect at

- (A) no point (B) two points
(C) infinite number of points (D) one point

[Step-by-step solution ► prepwiser.in/questions/bSpwr0p6SA](https://www.prepwiser.in/questions/bSpwr0p6SA)

Q22 JEE Main 2023 · 12 Apr · Shift 1

Let $y = y(x)$, $y > 0$, be a solution curve of the differential equation $(1 + x^2) dy = y(x - y)dx$. If $y(0) = 1$ and $y(2\sqrt{2}) = \beta$, then

(A) $e^{\beta-1} = e^{-2}(3 + 2\sqrt{2})$

(B) $e^{3\beta-1} = e(5 + \sqrt{2})$

(C) $e^{3\beta-1} = e(3 + 2\sqrt{2})$

(D) $e^{\beta-1} = e^{-2}(5 + \sqrt{2})$

[Step-by-step solution ► prepwiser.in/questions/SPrk50jamZ](https://www.prepwiser.in/questions/SPrk50jamZ)

Q23 JEE Main 2023 · 11 Apr · Shift 1

Let $y = y(x)$ be a solution curve of the differential equation.

$$(1 - x^2 y^2) dx = y dx + x dy.$$

If the line $x = 1$ intersects the curve $y = y(x)$ at $y = 2$ and the line $x = 2$ intersects the curve $y = y(x)$ at $y = \alpha$, then a value of α is :

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

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

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

(D) $\frac{3e^2}{2(3e^2+1)}$

[Step-by-step solution ► prepwiser.in/questions/-hEvcix39A](https://www.prepwiser.in/questions/-hEvcix39A)

Q24 JEE Main 2023 · 10 Apr · Shift 1

The slope of tangent at any point (x, y) on a curve $y = y(x)$ is $\frac{x^2+y^2}{2xy}$, $x > 0$. If $y(2) = 0$, then a value of $y(8)$ is :

(A) $-4\sqrt{2}$

(B) $2\sqrt{3}$

(C) $4\sqrt{3}$

(D) $-2\sqrt{3}$

[Step-by-step solution ► prepwiser.in/questions/xOF4pCEJfi](https://www.prepwiser.in/questions/xOF4pCEJfi)

Q25 JEE Main 2023 · 8 Apr · Shift 2

Let the solution curve $x = x(y)$, $0 < y < \frac{\pi}{2}$, of the differential equation

$$(\log_e(\cos y))^2 \cos y dx - (1 + 3x \log_e(\cos y)) \sin y dy = 0$$

satisfy $x\left(\frac{\pi}{3}\right) = \frac{1}{2 \log_e 2}$. If $x\left(\frac{\pi}{6}\right) = \frac{1}{\log_e m - \log_e n}$, where m and n are coprime, then mn is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/0aC_qeJmq](https://www.prepwiser.in/questions/0aC_qeJmq)

Q26 JEE Main 2023 · 6 Apr · Shift 2

If the solution curve $f(x, y) = 0$ of the differential equation

$$(1 + \log_e x) \frac{dx}{dy} - x \log_e x = e^y, x > 0,$$

passes through the points $(1, 0)$ and $(\alpha, 2)$, then α^α is equal to :

(A) $e^{\sqrt{2}e^2}$

(B) $e^{2e^{\sqrt{2}}}$

(C) e^{e^2}

(D) e^{2e^2}

[Step-by-step solution ► prepwiser.in/questions/0oV5J9-9oJ](https://www.prepwiser.in/questions/0oV5J9-9oJ)

Q27 JEE Main 2023 · 1 Feb · Shift 2

Let $\alpha x = \exp(x^\beta y^\gamma)$ be the solution of the differential equation

$$2x^2 y dy - (1 - xy^2) dx = 0, x > 0, y(2) = \sqrt{\log_e 2}$$

. Then $\alpha + \beta - \gamma$ equals :

- (A) 1 (B) 0
(C) 3 (D) -1

[Step-by-step solution ► prepwisser.in/questions/wjQOgbs6Bw](https://www.prepwisser.in/questions/wjQOgbs6Bw)

Q28 JEE Main 2023 · 1 Feb · Shift 1

The area enclosed by the closed curve C given by the differential equation

$$\frac{dy}{dx} + \frac{x+a}{y-2} = 0, y(1) = 0 \text{ is } 4\pi.$$

Let P and Q be the points of intersection of the curve C and the y-axis. If normals at P and Q on the curve C intersect x-axis at points R and S respectively, then the length of the line segment RS is :

- (A) $\frac{4\sqrt{3}}{3}$ (B) $2\sqrt{3}$
(C) 2 (D) $\frac{2\sqrt{3}}{3}$

[Step-by-step solution ► prepwisser.in/questions/N188hLP7zB](https://www.prepwisser.in/questions/N188hLP7zB)

Q29 JEE Main 2023 · 29 Jan · Shift 1

Let $y = f(x)$ be the solution of the differential equation $y(x+1)dx - x^2 dy = 0, y(1) = e$. Then $\lim_{x \rightarrow 0^+} f(x)$ is equal to

- (A) e^2 (B) 0
(C) $\frac{1}{e^2}$ (D) $\frac{1}{e}$

[Step-by-step solution ► prepwisser.in/questions/dqRCX_ZK2F](https://www.prepwisser.in/questions/dqRCX_ZK2F)

Q30 JEE Main 2023 · 25 Jan · Shift 1

Let $y = y(x)$ be the solution curve of the differential equation

$$\frac{dy}{dx} = \frac{y}{x} (1 + xy^2(1 + \log_e x)), x > 0, y(1) = 3$$

. Then $\frac{y^2(x)}{9}$ is equal to :

- (A) $\frac{x^2}{5-2x^3(2+\log_e x^3)}$
(B) $\frac{x^2}{3x^3(1+\log_e x^2)-2}$
(C) $\frac{x^2}{7-3x^3(2+\log_e x^2)}$
(D) $\frac{x^2}{2x^3(2+\log_e x^3)-3}$

[Step-by-step solution ► prepwisser.in/questions/B15izBBMbx](https://www.prepwisser.in/questions/B15izBBMbx)

Q31 JEE Main 2023 · 24 Jan · Shift 2

Let f be a differentiable function defined on $\left[0, \frac{\pi}{2}\right]$ such that $f(x) > 0$ and

$$f(x) + \int_0^x f(t) \sqrt{1 - (\log_e f(t))^2} dt = e, \forall x \in \left[0, \frac{\pi}{2}\right]$$

. Then $\left(6 \log_e f\left(\frac{\pi}{6}\right)\right)^2$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/gFPRhhKzsp](https://www.prepwiser.in/questions/gFPRhhKzsp)

Q32 JEE Main 2022 · 26 Jul · Shift 1

Let a curve $y = y(x)$ pass through the point $(3, 3)$ and the area of the region under this curve, above the x -axis and between the abscissae 3 and $x(> 3)$ be $\left(\frac{y}{x}\right)^3$. If this curve also passes through the point $(\alpha, 6\sqrt{10})$ in the first quadrant, then α is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/WjcXQRtMoH](https://www.prepwiser.in/questions/WjcXQRtMoH)

Q33 JEE Main 2022 · 25 Jul · Shift 2

Let a smooth curve $y = f(x)$ be such that the slope of the tangent at any point (x, y) on it is directly proportional to $\left(\frac{-y}{x}\right)$. If the curve passes through the points $(1, 2)$ and $(8, 1)$, then $\left|y\left(\frac{1}{8}\right)\right|$ is equal to

(A) $2 \log_e 2$

(B) 4

(C) 1

(D) $4 \log_e 2$

[Step-by-step solution ► prepwiser.in/questions/iNFfRaKxcT](https://www.prepwiser.in/questions/iNFfRaKxcT)

Q34 JEE Main 2022 · 30 Jun · Shift 1

A hostel has 100 students. On a certain day (consider it day zero) it was found that two students are infected with some virus. Assume that the rate at which the virus spreads is directly proportional to the product of the number of infected students and the number of non-infected students. If the number of infected students on 4th day is 30, then number of infected students on 8th day will be _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/3CSAsEKT-F](https://www.prepwiser.in/questions/3CSAsEKT-F)

Q35 JEE Main 2022 · 29 Jun · Shift 2

If $y = y(x)$ is the solution of the differential equation

$$(1 + e^{2x}) \frac{dy}{dx} + 2(1 + y^2) e^x = 0$$

and $y(0) = 0$, then

$$6 \left(y'(0) + \left(y(\log_e \sqrt{3}) \right)^2 \right)$$

is equal to

(A) 2

(B) -2

(C) -4

(D) -1

[Step-by-step solution ► prepwiser.in/questions/DB4kd-U7bR](https://www.prepwiser.in/questions/DB4kd-U7bR)

Q36 JEE Main 2022 · 27 Jun · Shift 2

If the solution curve of the differential equation

$((\tan^{-1}y) - x)dy = (1 + y^2)dx$ passes through the point $(1, 0)$, then the abscissa of the point on the curve whose ordinate is $\tan(1)$, is

- (A) $2e$ (B) $\frac{2}{e}$
(C) 2 (D) $\frac{1}{e}$

[Step-by-step solution ► prepwiset.in/questions/_rjXIk0AaO](https://www.prepwiset.in/questions/_rjXIk0AaO)

Q37 JEE Main 2022 · 27 Jun · Shift 1

If $\frac{dy}{dx} + \frac{2^{x-y}(2^y-1)}{2^x-1} = 0$, $x, y > 0$, $y(1) = 1$, then $y(2)$ is equal to :

- (A) $2 + \log_2 3$ (B) $2 + \log_3 2$
(C) $2 - \log_3 2$ (D) $2 - \log_2 3$

[Step-by-step solution ► prepwiset.in/questions/PFGg3uEHAs](https://www.prepwiset.in/questions/PFGg3uEHAs)

Q38 JEE Main 2022 · 26 Jun · Shift 1

Let

$$S = (0, 2\pi) - \left\{ \frac{\pi}{2}, \frac{3\pi}{4}, \frac{3\pi}{2}, \frac{7\pi}{4} \right\}$$

. Let $y = y(x)$, $x \in S$, be the solution curve of the differential equation

$$\frac{dy}{dx} = \frac{1}{1 + \sin 2x}, y\left(\frac{\pi}{4}\right) = \frac{1}{2}$$

. If the sum of abscissas of all the points of intersection of the curve $y = y(x)$ with the curve $y = \sqrt{2} \sin x$ is $\frac{k\pi}{12}$, then k is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiset.in/questions/q_aig8RgtE](https://www.prepwiset.in/questions/q_aig8RgtE)

Q39 JEE Main 2022 · 24 Jun · Shift 2

The slope of normal at any point (x, y) , $x > 0$, $y > 0$ on the curve $y = y(x)$ is given by $\frac{x^2}{xy - x^2y^2 - 1}$. If the curve passes through the point $(1, 1)$, then $e \cdot y(e)$ is equal to

- (A) $\frac{1 - \tan(1)}{1 + \tan(1)}$ (B) $\tan(1)$
(C) 1 (D) $\frac{1 + \tan(1)}{1 - \tan(1)}$

[Step-by-step solution ► prepwiset.in/questions/OxKk9KODAw](https://www.prepwiset.in/questions/OxKk9KODAw)

Q40 JEE Main 2021 · 31 Aug · Shift 2

If

$$\frac{dy}{dx} = \frac{2^x y + 2^y \cdot 2^x}{2^x + 2^{x+y} \log_e 2}$$

, $y(0) = 0$, then for $y = 1$, the value of x lies in the interval :

- (A) (1, 2) (B) $(\frac{1}{2}, 1]$
(C) (2, 3) (D) $(0, \frac{1}{2}]$

[Step-by-step solution ► prepwiser.in/questions/zytXV0f1AB](https://www.prepwiser.in/questions/zytXV0f1AB)

Q41 JEE Main 2021 · 31 Aug · Shift 1

If $\frac{dy}{dx} = \frac{2^{x+y} - 2^x}{2^y}$, $y(0) = 1$, then $y(1)$ is equal to :

- (A) $\log_2(2 + e)$
(B) $\log_2(1 + e)$
(C) $\log_2(2e)$
(D) $\log_2(1 + e^2)$

[Step-by-step solution ► prepwiser.in/questions/r4BGOAF5K3](https://www.prepwiser.in/questions/r4BGOAF5K3)

Q42 JEE Main 2021 · 27 Aug · Shift 2

If the solution curve of the differential equation $(2x - 10y^3)dy + ydx = 0$, passes through the points $(0, 1)$ and $(2, \beta)$, then β is a root of the equation :

- (A) $y^5 - 2y - 2 = 0$
(B) $2y^5 - 2y - 1 = 0$
(C) $2y^5 - y^2 - 2 = 0$
(D) $y^5 - y^2 - 1 = 0$

[Step-by-step solution ► prepwiser.in/questions/sFgdBb4Juc](https://www.prepwiser.in/questions/sFgdBb4Juc)

Q43 JEE Main 2021 · 27 Jul · Shift 1

If $y = y(x)$, $y \in [0, \frac{\pi}{2})$ is the solution of the differential equation $\sec y \frac{dy}{dx} - \sin(x + y) - \sin(x - y) = 0$, with $y(0) = 0$, then $5y'(\frac{\pi}{2})$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/dnVxKvqkSV](https://www.prepwiser.in/questions/dnVxKvqkSV)

Q44 JEE Main 2021 · 27 Jul · Shift 2

Let $y = y(x)$ be the solution of the differential equation $dy = e^{\alpha x + y} dx$; $\alpha \in \mathbb{N}$. If $y(\log_e 2) = \log_e 2$ and $y(0) = \log_e(\frac{1}{2})$, then the value of α is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/vLglhDYSDf](https://www.prepwiser.in/questions/vLglhDYSDf)

Q45 JEE Main 2021 · 27 Jul · Shift 1

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

$$\log \left(\frac{dy}{dx} \right) = 3x + 4y, \text{ with } y(0) = 0.$$

If $y \left(-\frac{2}{3} \log_e 2 \right) = \alpha \log_e 2$, then the value of α is equal to :

(A) $-\frac{1}{4}$

(B) $\frac{1}{4}$

(C) 2

(D) $-\frac{1}{2}$

[Step-by-step solution ► prepwisser.in/questions/63UuRy3JEX](https://www.prepwisser.in/questions/63UuRy3JEX)

Q46 JEE Main 2021 · 25 Jul · Shift 1

Let $y = y(x)$ be solution of the following differential equation

$$e^y \frac{dy}{dx} - 2e^y \sin x + \sin x \cos^2 x = 0, y \left(\frac{\pi}{2} \right) = 0$$

If $y(0) = \log_e(\alpha + \beta e^{-2})$, then $4(\alpha + \beta)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/YImae6VGiG](https://www.prepwisser.in/questions/YImae6VGiG)

Q47 JEE Main 2021 · 25 Jul · Shift 2

Let a curve $y = f(x)$ pass through the point $(2, (\log_e 2)^2)$ and have slope $\frac{2y}{x \log_e x}$ for all positive real value of x . Then the value of $f(e)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/YKUm1oqRxI](https://www.prepwisser.in/questions/YKUm1oqRxI)

Q48 JEE Main 2021 · 22 Jul · Shift 2

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

$$\left((x+2)e^{\left(\frac{y+1}{x+2}\right)} + (y+1) \right) dx = (x+2) dy$$

, $y(1) = 1$. If the domain of $y = y(x)$ is an open interval (α, β) , then $|\alpha + \beta|$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/QUexpE24rI](https://www.prepwisser.in/questions/QUexpE24rI)

Q49 JEE Main 2021 · 20 Jul · Shift 1

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

(A) $1 - 4e^3$

(B) $1 - 4e^6$

(C) $1 + 4e^3$

(D) $1 + 4e^6$

[Step-by-step solution ► prepwisser.in/questions/j0ZmZvWfVh](https://www.prepwisser.in/questions/j0ZmZvWfVh)

Q50 JEE Main 2021 · 20 Jul · Shift 2

Let a curve $y = y(x)$ be given by the solution of the differential equation

$$\cos\left(\frac{1}{2}\cos^{-1}(e^{-x})\right)dx = \sqrt{e^{2x} - 1}dy$$

. If it intersects y-axis at $y = -1$, and the intersection point of the curve with x-axis is $(\alpha, 0)$, then e^α is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/SW2XD4C1ut](https://www.prepwiser.in/questions/SW2XD4C1ut)

Q51 JEE Main 2021 · 18 Mar · Shift 2

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

$\frac{dy}{dx} = (y + 1) \left((y + 1)e^{x^2/2} - x \right)$, $0 < x < 2.1$, with $y(2) = 0$. Then the value of $\frac{dy}{dx}$ at $x = 1$ is equal to :

- (A) $\frac{e^{5/2}}{(1+e^2)^2}$
- (B) $\frac{5e^{1/2}}{(e^2+1)^2}$
- (C) $-\frac{2e^2}{(1+e^2)^2}$
- (D) $\frac{-e^{3/2}}{(e^2+1)^2}$

[Step-by-step solution ► prepwiser.in/questions/eML1DIR9I2](https://www.prepwiser.in/questions/eML1DIR9I2)

Q52 JEE Main 2021 · 18 Mar · Shift 1

The differential equation satisfied by the system of parabolas

$y^2 = 4a(x + a)$ is :

- (A) $y \left(\frac{dy}{dx} \right)^2 - 2x \left(\frac{dy}{dx} \right) - y = 0$
- (B) $y \left(\frac{dy}{dx} \right)^2 - 2x \left(\frac{dy}{dx} \right) + y = 0$
- (C) $y \left(\frac{dy}{dx} \right)^2 + 2x \left(\frac{dy}{dx} \right) - y = 0$
- (D) $y \left(\frac{dy}{dx} \right) + 2x \left(\frac{dy}{dx} \right) - y = 0$

[Step-by-step solution ► prepwiser.in/questions/8TW_-sZspM](https://www.prepwiser.in/questions/8TW_-sZspM)

Q53 JEE Main 2021 · 17 Mar · Shift 1

Which of the following is true for $y(x)$ that satisfies the differential equation

$$\frac{dy}{dx} = xy - 1 + x - y; y(0) = 0 :$$

(A) $y(1) = 1$

(B) $y(1) = e^{-\frac{1}{2}} - e^{-\frac{1}{2}}$

(C) $y(1) = e^{\frac{1}{2}} - e^{-\frac{1}{2}}$

(D) $y(1) = e^{\frac{1}{2}} - 1$

[Step-by-step solution ► prepwiser.in/questions/_Rgr-f27MI](https://www.prepwiser.in/questions/_Rgr-f27MI)

Q54 JEE Main 2021 · 26 Feb · Shift 1

The rate of growth of bacteria in a culture is proportional to the number of bacteria present and the bacteria count is 1000 at initial time $t = 0$. The number of bacteria is increased by 20% in 2 hours. If the population of bacteria is 2000 after $\frac{k}{\log_e \left(\frac{6}{5}\right)}$ hours, then $\left(\frac{k}{\log_e 2}\right)^2$ is equal to :

(A) 16

(B) 8

(C) 2

(D) 4

[Step-by-step solution ► prepwiser.in/questions/cGITssyTsQ](https://www.prepwiser.in/questions/cGITssyTsQ)

Q55 JEE Main 2020 · 6 Sep · Shift 1

The general solution of the differential equation

$$\sqrt{1+x^2+y^2+x^2y^2} + xy \frac{dy}{dx} = 0 \text{ is :}$$

(where C is a constant of integration)

(A) $\sqrt{1+y^2} + \sqrt{1+x^2} = \frac{1}{2} \log_e \left(\frac{\sqrt{1+x^2}-1}{\sqrt{1+x^2}+1} \right) + C$

(B) $\sqrt{1+y^2} - \sqrt{1+x^2} = \frac{1}{2} \log_e \left(\frac{\sqrt{1+x^2}-1}{\sqrt{1+x^2}+1} \right) + C$

(C) $\sqrt{1+y^2} + \sqrt{1+x^2} = \frac{1}{2} \log_e \left(\frac{\sqrt{1+x^2}+1}{\sqrt{1+x^2}-1} \right) + C$

(D) $\sqrt{1+y^2} - \sqrt{1+x^2} = \frac{1}{2} \log_e \left(\frac{\sqrt{1+x^2}+1}{\sqrt{1+x^2}-1} \right) + C$

[Step-by-step solution ► prepwiser.in/questions/-SGm0snTQE](https://www.prepwiser.in/questions/-SGm0snTQE)

Q56 JEE Main 2020 · 5 Sep · Shift 1

If $y = y(x)$ is the solution of the differential

equation $\frac{5+e^x}{2+y} \cdot \frac{dy}{dx} + e^x = 0$ satisfying $y(0) = 1$, then a value of $y(\log_e 13)$ is :

- (A) -1 (B) 1
(C) 0 (D) 2

[Step-by-step solution ► prepwisser.in/questions/RMRpaBkbYB](https://www.prepwisser.in/questions/RMRpaBkbYB)

Q57 JEE Main 2020 · 4 Sep · Shift 2

The solution of the differential equation

$$\frac{dy}{dx} - \frac{y+3x}{\log_e(y+3x)} + 3 = 0$$

is:

(where c is a constant of integration)

- (A) $x - \frac{1}{2}(\log_e(y+3x))^2 = C$
(B) $y + 3x - \frac{1}{2}(\log_e x)^2 = C$
(C) $x - \log_e(y+3x) = C$
(D) $x - 2\log_e(y+3x) = C$

[Step-by-step solution ► prepwisser.in/questions/_UBhiRUjOm](https://www.prepwisser.in/questions/_UBhiRUjOm)

Q58 JEE Main 2020 · 3 Sep · Shift 2

If $x^3 dy + xy dx = x^2 dy + 2y dx$; $y(2) = e$ and $x > 1$, then $y(4)$ is equal to :

- (A) $\frac{\sqrt{e}}{2}$ (B) $\frac{1}{2} + \sqrt{e}$
(C) $\frac{3}{2} + \sqrt{e}$ (D) $\frac{3}{2}\sqrt{e}$

[Step-by-step solution ► prepwisser.in/questions/PMT-YCCni4](https://www.prepwisser.in/questions/PMT-YCCni4)

Q59 JEE Main 2020 · 3 Sep · Shift 1

The solution curve of the differential equation,

$$(1 + e^{-x})(1 + y^2) \frac{dy}{dx} = y^2,$$

which passes through the point $(0, 1)$, is :

- (A) $y^2 + 1 = y \left(\log_e \left(\frac{1+e^{-x}}{2} \right) + 2 \right)$
(B) $y^2 + 1 = y \left(\log_e \left(\frac{1+e^x}{2} \right) + 2 \right)$
(C) $y^2 = 1 + y \log_e \left(\frac{1+e^{-x}}{2} \right)$
(D) $y^2 = 1 + y \log_e \left(\frac{1+e^x}{2} \right)$

[Step-by-step solution ► prepwisser.in/questions/J7uHIJ5t9z](https://www.prepwisser.in/questions/J7uHIJ5t9z)

Q60 JEE Main 2020 · 2 Sep · Shift 1

Let $y = y(x)$ be the solution of the differential equation,

$$\frac{2+\sin x}{y+1} \cdot \frac{dy}{dx} = -\cos x, y > 0, y(0) = 1.$$

If $y(\pi) = a$ and $\frac{dy}{dx}$ at $x = \pi$ is b , then the ordered pair (a, b) is equal to :

- (A) $(2, 1)$ (B) $(2, \frac{3}{2})$
(C) $(1, -1)$ (D) $(1, 1)$

[Step-by-step solution ► prepwiser.in/questions/8xcRsk3mev](https://www.prepwiser.in/questions/8xcRsk3mev)

Q61 JEE Main 2020 · 8 Jan · Shift 1

Let $y = y(x)$ be a solution of the differential equation,

$$\sqrt{1-x^2} \frac{dy}{dx} + \sqrt{1-y^2} = 0, |x| < 1.$$

If $y(\frac{1}{2}) = \frac{\sqrt{3}}{2}$, then $y(-\frac{1}{\sqrt{2}})$ is equal to :

- (A) $-\frac{\sqrt{3}}{2}$ (B) None of those
(C) $\frac{1}{\sqrt{2}}$ (D) $-\frac{1}{\sqrt{2}}$

[Step-by-step solution ► prepwiser.in/questions/d-FILUjjoG](https://www.prepwiser.in/questions/d-FILUjjoG)

Q62 JEE Main 2020 · 7 Jan · Shift 1

If $y = y(x)$ is the solution of the differential equation, $e^y \left(\frac{dy}{dx} - 1 \right) = e^x$ such that $y(0) = 0$, then $y(1)$ is equal to:

- (A) $2 + \log_e 2$
(B) $\log_e 2$
(C) $1 + \log_e 2$
(D) $2e$

[Step-by-step solution ► prepwiser.in/questions/_iy2nj7HZt](https://www.prepwiser.in/questions/_iy2nj7HZt)

Linear Differential Equations · 89 PYQs

Q63 JEE Main 2025 · 8 Apr · Shift 2

Let $f(x) = x - 1$ and $g(x) = e^x$ for $x \in \mathbb{R}$. If $\frac{dy}{dx} = \left(e^{-2\sqrt{x}} g(f(f(x))) - \frac{y}{\sqrt{x}} \right)$, $y(0) = 0$, then $y(1)$ is

- (A) $\frac{1-e^3}{e^4}$
(B) $\frac{e-1}{e^4}$
(C) $\frac{1-e^2}{e^4}$
(D) $\frac{2e-1}{e^3}$

[Step-by-step solution ► prepwiser.in/questions/IIek3Gfgei](https://www.prepwiser.in/questions/IIek3Gfgei)

Q64 JEE Main 2025 · 7 Apr · Shift 1

Let $y = y(x)$ be the solution curve of the differential equation

$x(x^2 + e^x) dy + (e^x(x - 2)y - x^3) dx = 0, x > 0$, passing through the point $(1, 0)$. Then $y(2)$ is equal to :

- (A) $\frac{2}{2+e^2}$ (B) $\frac{4}{4-e^2}$
(C) $\frac{4}{4+e^2}$ (D) $\frac{2}{2-e^2}$

Step-by-step solution ► [prepwisar.in/questions/S9iXAWbj9](https://www.prepwisar.in/questions/S9iXAWbj9)

Q65 JEE Main 2025 · 7 Apr · Shift 2

Let $y = y(x)$ be the solution of the differential equation $(x^2 + 1)y' - 2xy = (x^4 + 2x^2 + 1) \cos x$,

$y(0) = 1$. Then $\int_{-3}^3 y(x) dx$ is :

- (A) 36
(B) 24
(C) 18
(D) 30

Step-by-step solution ► [prepwisar.in/questions/OBIL8yvmGL](https://www.prepwisar.in/questions/OBIL8yvmGL)

Q66 JEE Main 2025 · 4 Apr · Shift 2

If a curve $y = y(x)$ passes through the point $(1, \frac{\pi}{2})$ and satisfies the differential equation $(7x^4 \cot y - e^x \operatorname{cosec} y) \frac{dx}{dy} = x^5, x \geq 1$, then at $x = 2$, the value of $\cos y$ is :

- (A) $\frac{2e^2+e}{64}$
(B) $\frac{2e^2-e}{64}$
(C) $\frac{2e^2-e}{128}$
(D) $\frac{2e^2+e}{128}$

Step-by-step solution ► [prepwisar.in/questions/FD_vam1Rlq](https://www.prepwisar.in/questions/FD_vam1Rlq)

Q67 JEE Main 2025 · 3 Apr · Shift 1

Let g be a differentiable function such that $\int_0^x g(t) dt = x - \int_0^x \operatorname{tg}(t) dt, x \geq 0$ and let $y = y(x)$ satisfy the differential equation $\frac{dy}{dx} - y \tan x = 2(x + 1) \sec x g(x), x \in [0, \frac{\pi}{2})$. If $y(0) = 0$, then $y(\frac{\pi}{3})$ is equal to

- (A) $\frac{4\pi}{3}$ (B) $\frac{2\pi}{3}$
(C) $\frac{2\pi}{3\sqrt{3}}$ (D) $\frac{4\pi}{3\sqrt{3}}$

Step-by-step solution ► [prepwisar.in/questions/16eVSpNfGb](https://www.prepwisar.in/questions/16eVSpNfGb)

Q68 JEE Main 2025 · 3 Apr · Shift 2

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

$\frac{dy}{dx} + 3(\tan^2 x) y + 3y = \sec^2 x, y(0) = \frac{1}{3} + e^3$. Then $y(\frac{\pi}{4})$ is equal to :

- (A) $\frac{4}{3}$ (B) $\frac{2}{3} + e^3$
(C) $\frac{4}{3} + e^3$ (D) $\frac{2}{3}$

Step-by-step solution ► [prepwisar.in/questions/8MXqc8XjSi](https://www.prepwisar.in/questions/8MXqc8XjSi)

Q69 JEE Main 2025 · 2 Apr · Shift 1

Let $f : \mathbf{R} \rightarrow \mathbf{R}$ be a thrice differentiable odd function satisfying $f'(x) \geq 0$, $f''(x) = f(x)$, $f(0) = 0$, $f'(0) = 3$. Then $9f(\log_e 3)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/I6qNRT0K4R](https://www.prepwisar.in/questions/I6qNRT0K4R)

Q70 JEE Main 2025 · 2 Apr · Shift 2

Let $y = y(x)$ be the solution of the differential equation $\frac{dy}{dx} + 2y \sec^2 x = 2 \sec^2 x + 3 \tan x \cdot \sec^2 x$ such that $y(0) = \frac{5}{4}$. Then $12 \left(y\left(\frac{\pi}{4}\right) - e^{-2} \right)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/g_XHicky70](https://www.prepwisar.in/questions/g_XHicky70)

Q71 JEE Main 2025 · 29 Jan · Shift 2

If for the solution curve $y = f(x)$ of the differential equation $\frac{dy}{dx} + (\tan x)y = \frac{2+\sec x}{(1+2 \sec x)^2}$, $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, $f\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{10}$, then $f\left(\frac{\pi}{4}\right)$ is equal to:

- (A) $\frac{5-\sqrt{3}}{2\sqrt{2}}$
- (B) $\frac{4-\sqrt{2}}{14}$
- (C) $\frac{9\sqrt{3}+3}{10(4+\sqrt{3})}$
- (D) $\frac{\sqrt{3}+1}{10(4+\sqrt{3})}$

[Step-by-step solution ► prepwisar.in/questions/Puad_IjklZ](https://www.prepwisar.in/questions/Puad_IjklZ)

Q72 JEE Main 2025 · 29 Jan · Shift 1

Let $y = y(x)$ be the solution of the differential equation :

$\cos x (\log_e(\cos x))^2 dy + (\sin x - 3y \sin x \log_e(\cos x)) dx = 0$, $x \in (0, \frac{\pi}{2})$. If $y(\frac{\pi}{4}) = -\frac{1}{\log_e 2}$, then $y(\frac{\pi}{6})$ is equal to :

- (A) $\frac{2}{\log_e(3)-\log_e(4)}$
- (B) $-\frac{1}{\log_e(4)}$
- (C) $\frac{1}{\log_e(4)-\log_e(3)}$
- (D) $\frac{1}{\log_e(3)-\log_e(4)}$

[Step-by-step solution ► prepwisar.in/questions/v9pVrte_4U](https://www.prepwisar.in/questions/v9pVrte_4U)

Q73 JEE Main 2025 · 28 Jan · Shift 2

If $y = y(x)$ is the solution of the differential equation, $\sqrt{4-x^2} \frac{dy}{dx} = \left(\left(\sin^{-1} \left(\frac{x}{2} \right) \right)^2 - y \right) \sin^{-1} \left(\frac{x}{2} \right)$, $-2 \leq x \leq 2$, $y(2) = \frac{\pi^2-8}{4}$, then $y^2(0)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/8DiA8naUKD](https://www.prepwisar.in/questions/8DiA8naUKD)

Q74 JEE Main 2025 · 24 Jan · Shift 2

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

$2 \cos x \frac{dy}{dx} = \sin 2x - 4y \sin x$, $x \in (0, \frac{\pi}{2})$. If $y\left(\frac{\pi}{3}\right) = 0$, then $y'\left(\frac{\pi}{4}\right) + y\left(\frac{\pi}{4}\right)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/_ovTfalXxG](https://www.prepwisar.in/questions/_ovTfalXxG)

Q75 JEE Main 2025 · 24 Jan · Shift 1

Let f be a differentiable function such that $2(x+2)^2 f(x) - 3(x+2)^2 = 10 \int_0^x (t+2)f(t)dt, x \geq 0$. Then $f(2)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/003OgvIRpn](https://www.prepwiser.in/questions/003OgvIRpn)

Q76 JEE Main 2025 · 24 Jan · Shift 2

Let $f : (0, \infty) \rightarrow \mathbf{R}$ be a function which is differentiable at all points of its domain and satisfies the condition $x^2 f'(x) = 2x f(x) + 3$, with $f(1) = 4$. Then $2f(2)$ is equal to :

- (A) 19 (B) 23
(C) 29 (D) 39

[Step-by-step solution ► prepwiser.in/questions/IBlc2JRYNL](https://www.prepwiser.in/questions/IBlc2JRYNL)

Q77 JEE Main 2025 · 22 Jan · Shift 2

If $x = f(y)$ is the solution of the differential equation $(1 + y^2) + (x - 2e^{\tan^{-1} y}) \frac{dy}{dx} = 0, y \in (-\frac{\pi}{2}, \frac{\pi}{2})$ with $f(0) = 1$, then $f\left(\frac{1}{\sqrt{3}}\right)$ is equal to :

- (A) $e^{\pi/4}$ (B) $e^{\pi/12}$
(C) $e^{\pi/6}$ (D) $e^{\pi/3}$

[Step-by-step solution ► prepwiser.in/questions/i1KxXdac6R](https://www.prepwiser.in/questions/i1KxXdac6R)

Q78 JEE Main 2025 · 22 Jan · Shift 2

Let $y = f(x)$ be the solution of the differential equation $\frac{dy}{dx} + \frac{xy}{x^2-1} = \frac{x^6+4x}{\sqrt{1-x^2}}, -1 < x < 1$ such that $f(0) = 0$. If $6 \int_{-1/2}^{1/2} f(x)dx = 2\pi - \alpha$ then α^2 is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/i8f14fybjO](https://www.prepwiser.in/questions/i8f14fybjO)

Q79 JEE Main 2025 · 22 Jan · Shift 1

Let $x = x(y)$ be the solution of the differential equation $y^2 dx + \left(x - \frac{1}{y}\right) dy = 0$. If $x(1) = 1$, then $x\left(\frac{1}{2}\right)$ is :

- (A) $\frac{3}{2} + e$ (B) $\frac{1}{2} + e$
(C) $3 + e$ (D) $3 - e$

[Step-by-step solution ► prepwiser.in/questions/PuOdbKF-Fx](https://www.prepwiser.in/questions/PuOdbKF-Fx)

Q80 JEE Main 2024 · 9 Apr · Shift 2

For a differentiable function $f : \mathbf{R} \rightarrow \mathbf{R}$, suppose $f'(x) = 3f(x) + \alpha$, where $\alpha \in \mathbf{R}, f(0) = 1$ and $\lim_{x \rightarrow -\infty} f(x) = 7$. Then $9f(-\log_e 3)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/6gEgw9CCua](https://www.prepwiser.in/questions/6gEgw9CCua)

Q81 JEE Main 2024 · 8 Apr · Shift 2

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

- (A) $\frac{\pi}{6}$ (B) $\frac{\pi}{12}$
(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

[Step-by-step solution ► prepwiser.in/questions/PUUpCte2vm6](https://www.prepwiser.in/questions/PUUpCte2vm6)

Q82 JEE Main 2024 · 6 Apr · Shift 1

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

- (A) $\frac{1}{4} (e^{\pi/2} - 1)$ (B) $\frac{1}{2} (1 - e^{\pi/2})$
(C) $\frac{1}{4} (1 - e^{\pi/2})$ (D) $\frac{1}{2} (e^{\pi/2} - 1)$

[Step-by-step solution ► prepwiser.in/questions/OhBoGioppT](https://www.prepwiser.in/questions/OhBoGioppT)

Q83 JEE Main 2024 · 6 Apr · Shift 1

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

- (A) $-\frac{3}{e}$ (B) $-\frac{3}{2e}$
(C) $-\frac{2}{3e}$ (D) $-\frac{2}{e}$

[Step-by-step solution ► prepwiser.in/questions/2aTu29pPx_](https://www.prepwiser.in/questions/2aTu29pPx_)

Q84 JEE Main 2024 · 5 Apr · Shift 1

If $y = y(x)$ is the solution of the differential equation $\frac{dy}{dx} + 2y = \sin(2x)$, $y(0) = \frac{3}{4}$, then $y\left(\frac{\pi}{8}\right)$ is equal to :

- (A) $e^{-\pi/8}$ (B) $e^{\pi/4}$
(C) $e^{-\pi/4}$ (D) $e^{\pi/8}$

[Step-by-step solution ► prepwiser.in/questions/3QH0cBL4T](https://www.prepwiser.in/questions/3QH0cBL4T)

Q85 JEE Main 2024 · 5 Apr · Shift 2

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

$$\frac{dy}{dx} + \frac{2x}{(1+x^2)^2} y = x e^{\frac{1}{(1+x^2)}}; y(0) = 0.$$

Then the area enclosed by the curve $f(x) = y(x)e^{-\frac{1}{(1+x^2)}}$ and the line $y - x = 4$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/uOgFVAB_nK](https://www.prepwiser.in/questions/uOgFVAB_nK)

Q86 JEE Main 2024 · 5 Apr · Shift 1

Let f be a differentiable function in the interval $(0, \infty)$ such that $f(1) = 1$ and $\lim_{t \rightarrow x} \frac{t^2 f(x) - x^2 f(t)}{t - x} = 1$ for each $x > 0$. Then $2f(2) + 3f(3)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/UCLi7ow4qq](https://www.prepwiser.in/questions/UCLi7ow4qq)

Q87 JEE Main 2024 · 4 Apr · Shift 2

Let $y = y(x)$ be the solution of the differential equation $(x^2 + 4)^2 dy + (2x^3 y + 8xy - 2) dx = 0$. If $y(0) = 0$, then $y(2)$ is equal to

- (A) 2π (B) $\frac{\pi}{8}$
(C) $\frac{\pi}{16}$ (D) $\frac{\pi}{32}$

Step-by-step solution ► [prepwisser.in/questions/UPfQPgEdOF](https://www.prepwisser.in/questions/UPfQPgEdOF)

Q88 JEE Main 2024 · 4 Apr · Shift 1

Let the solution $y = y(x)$ of the differential equation $\frac{dy}{dx} - y = 1 + 4 \sin x$ satisfy $y(\pi) = 1$. Then $y\left(\frac{\pi}{2}\right) + 10$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/1VNkSPIq8h](https://www.prepwisser.in/questions/1VNkSPIq8h)

Q89 JEE Main 2024 · 1 Feb · Shift 2

If $\frac{dx}{dy} = \frac{1+x-y^2}{y}$, $x(1) = 1$, then $5x(2)$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/OZAChRUaYs](https://www.prepwisser.in/questions/OZAChRUaYs)

Q90 JEE Main 2024 · 1 Feb · Shift 2

Let α be a non-zero real number. Suppose $f : \mathbf{R} \rightarrow \mathbf{R}$ is a differentiable function such that $f(0) = 2$ and $\lim_{x \rightarrow -\infty} f(x) = 1$. If $f'(x) = \alpha f(x) + 3$, for all $x \in \mathbf{R}$, then $f(-\log_e 2)$ is equal to :

- (A) 7 (B) 9
(C) 3 (D) 5

Step-by-step solution ► [prepwisser.in/questions/tnol7MYGu-](https://www.prepwisser.in/questions/tnol7MYGu-)

Q91 JEE Main 2024 · 31 Jan · Shift 1

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

$$\frac{dy}{dx} = \frac{(\tan x) + y}{\sin x (\sec x - \sin x \tan x)}, x \in \left(0, \frac{\pi}{2}\right)$$

satisfying the condition $y\left(\frac{\pi}{4}\right) = 2$. Then, $y\left(\frac{\pi}{3}\right)$ is

- (A) $\sqrt{3}(2 + \log_e 3)$
(B) $\sqrt{3}(1 + 2 \log_e 3)$
(C) $\sqrt{3}(2 + \log_e \sqrt{3})$
(D) $\frac{\sqrt{3}}{2}(2 + \log_e 3)$

Step-by-step solution ► [prepwisser.in/questions/pD7zN5dcXv](https://www.prepwisser.in/questions/pD7zN5dcXv)

Q92 JEE Main 2024 · 30 Jan · Shift 1

Let $y = y(x)$ be the solution of the differential equation $\sec x dy + \{2(1-x)\tan x + x(2-x)\}dx = 0$ such that $y(0) = 2$. Then $y(2)$ is equal to:

- (A) $2\{\sin(2) + 1\}$ (B) 2
(C) 1 (D) $2\{1 - \sin(2)\}$

Step-by-step solution ► [prepwisser.in/questions/qe3WTGpck5](https://www.prepwisser.in/questions/qe3WTGpck5)

Q93 JEE Main 2024 · 30 Jan · Shift 1

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

$$(1 - x^2) dy = [xy + (x^3 + 2) \sqrt{3(1 - x^2)}] dx, -1 < x < 1, y(0) = 0$$

. If $y\left(\frac{1}{2}\right) = \frac{m}{n}$, m and n are co-prime numbers, then $m + n$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/GIh_yIFYku](https://www.prepwiser.in/questions/GIh_yIFYku)

Q94 JEE Main 2024 · 29 Jan · Shift 1

A function $y = f(x)$ satisfies $f(x) \sin 2x + \sin x - (1 + \cos^2 x) f'(x) = 0$ with condition $f(0) = 0$. Then, $f\left(\frac{\pi}{2}\right)$ is equal to

- (A) 2 (B) 1
(C) -1 (D) 0

[Step-by-step solution ► prepwiser.in/questions/mL4Pcz2H6](https://www.prepwiser.in/questions/mL4Pcz2H6)

Q95 JEE Main 2024 · 27 Jan · Shift 1

Let $x = x(t)$ and $y = y(t)$ be solutions of the differential equations $\frac{dx}{dt} + ax = 0$ and $\frac{dy}{dt} + by = 0$ respectively, $a, b \in \mathbf{R}$. Given that $x(0) = 2$; $y(0) = 1$ and $3y(1) = 2x(1)$, the value of t , for which $x(t) = y(t)$, is :

- (A) $\log_{\frac{2}{3}} 2$ (B) $\log_{\frac{4}{3}} 2$
(C) $\log_4 3$ (D) $\log_3 4$

[Step-by-step solution ► prepwiser.in/questions/081oCKXTzH](https://www.prepwiser.in/questions/081oCKXTzH)

Q96 JEE Main 2023 · 15 Apr · Shift 1

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

$$2(y + 2) \log_e(y + 2) dx + (x + 4 - 2 \log_e(y + 2)) dy = 0, y > -1$$

with $x(e^4 - 2) = 1$. Then $x(e^9 - 2)$ is equal to :

- (A) $\frac{4}{9}$ (B) $\frac{32}{9}$
(C) $\frac{10}{3}$ (D) 3

[Step-by-step solution ► prepwiser.in/questions/Goh1CCsAE0](https://www.prepwiser.in/questions/Goh1CCsAE0)

Q97 JEE Main 2023 · 13 Apr · Shift 2

If $y = y(x)$ is the solution of the differential equation

$$\frac{dy}{dx} + \frac{4x}{(x^2 - 1)}y = \frac{x + 2}{(x^2 - 1)^{\frac{5}{2}}}, x > 1$$

such that

$$y(2) = \frac{2}{9} \log_e(2 + \sqrt{3}) \text{ and } y(\sqrt{2}) = \alpha \log_e(\sqrt{\alpha} + \beta) + \beta - \sqrt{\gamma}, \alpha, \beta, \gamma \in \mathbb{N}, \text{ then } \alpha\beta\gamma \text{ is equal to}$$

:

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/4mBzfzyUj](https://www.prepwisar.in/questions/4mBzfzyUj)

Q98 JEE Main 2023 · 11 Apr · Shift 2

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

$$\frac{dy}{dx} + \frac{5}{x(x^5 + 1)}y = \frac{(x^5 + 1)^2}{x^7}, x > 0$$

. If $y(1) = 2$, then $y(2)$ is equal to :

(A) $\frac{693}{128}$

(B) $\frac{697}{128}$

(C) $\frac{637}{128}$

(D) $\frac{679}{128}$

[Step-by-step solution ► prepwisar.in/questions/VkvS1fjBem](https://www.prepwisar.in/questions/VkvS1fjBem)

Q99 JEE Main 2023 · 10 Apr · Shift 1

Let f be a differentiable function such that $x^2 f(x) - x = 4 \int_0^x t f(t) dt$, $f(1) = \frac{2}{3}$. Then $18f(3)$ is equal to :

(A) 160

(B) 210

(C) 150

(D) 180

[Step-by-step solution ► prepwisar.in/questions/L3MDiojsDC](https://www.prepwisar.in/questions/L3MDiojsDC)

Q100 JEE Main 2023 · 8 Apr · Shift 1

If the solution curve of the differential equation $(y - 2 \log_e x) dx + (x \log_e x^2) dy = 0$, $x > 1$ passes through the points $(e, \frac{4}{3})$ and (e^4, α) , then α is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/DOn_h-aOL](https://www.prepwisar.in/questions/DOn_h-aOL)

Q101 JEE Main 2023 · 6 Apr · Shift 1

Let $y = y(x)$ be a solution of the differential equation $(x \cos x)dy + (xy \sin x + y \cos x - 1)dx = 0$, $0 < x < \frac{\pi}{2}$. If $\frac{\pi}{3}y\left(\frac{\pi}{3}\right) = \sqrt{3}$, then

$$\left| \frac{\pi}{6}y''\left(\frac{\pi}{6}\right) + 2y'\left(\frac{\pi}{6}\right) \right|$$

is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/G01iC7lqoj](https://www.prepwisser.in/questions/G01iC7lqoj)

Q102 JEE Main 2023 · 1 Feb · Shift 1

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a differentiable function such that $f'(x) + f(x) = \int_0^2 f(t)dt$. If $f(0) = e^{-2}$, then $2f(0) - f(2)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/BzO5a6fZwu](https://www.prepwisser.in/questions/BzO5a6fZwu)

Q103 JEE Main 2023 · 1 Feb · Shift 1

If $y = y(x)$ is the solution curve of the differential equation

$\frac{dy}{dx} + y \tan x = x \sec x$, $0 \leq x \leq \frac{\pi}{3}$, $y(0) = 1$, then $y\left(\frac{\pi}{6}\right)$ is equal to

- (A) $\frac{\pi}{12} - \frac{\sqrt{3}}{2} \log_e \left(\frac{2\sqrt{3}}{e} \right)$
- (B) $\frac{\pi}{12} + \frac{\sqrt{3}}{2} \log_e \left(\frac{2\sqrt{3}}{e} \right)$
- (C) $\frac{\pi}{12} + \frac{\sqrt{3}}{2} \log_e \left(\frac{2}{e\sqrt{3}} \right)$
- (D) $\frac{\pi}{12} - \frac{\sqrt{3}}{2} \log_e \left(\frac{2}{e\sqrt{3}} \right)$

[Step-by-step solution ► prepwisser.in/questions/940di8GJqT](https://www.prepwisser.in/questions/940di8GJqT)

Q104 JEE Main 2023 · 30 Jan · Shift 1

Let the solution curve $y = y(x)$ of the differential equation

$$\frac{dy}{dx} - \frac{3x^5 \tan^{-1}(x^3)}{(1+x^6)^{3/2}} y = 2x \exp \left\{ \frac{x^3 - \tan^{-1} x^3}{\sqrt{1+x^6}} \right\}$$
 pass through the origin. Then $y(1)$ is equal to :

- (A) $\exp \left(\frac{1-\pi}{4\sqrt{2}} \right)$
- (B) $\exp \left(\frac{4-\pi}{4\sqrt{2}} \right)$
- (C) $\exp \left(\frac{4+\pi}{4\sqrt{2}} \right)$
- (D) $\exp \left(\frac{\pi-4}{4\sqrt{2}} \right)$

[Step-by-step solution ► prepwisser.in/questions/1VXRVPeW0K](https://www.prepwisser.in/questions/1VXRVPeW0K)

Q105 JEE Main 2023 · 29 Jan · Shift 2

Let $y = y(x)$ be the solution of the differential equation $x \log_e x \frac{dy}{dx} + y = x^2 \log_e x$, ($x > 1$). If $y(2) = 2$, then $y(e)$ is equal to

- (A) $\frac{1+e^2}{2}$ (B) $\frac{1+e^2}{4}$
(C) $\frac{2+e^2}{2}$ (D) $\frac{4+e^2}{4}$

Step-by-step solution ► [prepwisar.in/questions/ozvzg7cIWx](https://www.prepwisar.in/questions/ozvzg7cIWx)

Q106 JEE Main 2023 · 25 Jan · Shift 2

Let $y = y(t)$ be a solution of the differential equation $\frac{dy}{dt} + \alpha y = \gamma e^{-\beta t}$ where, $\alpha > 0, \beta > 0$ and $\gamma > 0$. Then $\lim_{t \rightarrow \infty} y(t)$

- (A) is 0 (B) is 1
(C) is -1 (D) does not exist

Step-by-step solution ► [prepwisar.in/questions/rv8aKurpvz](https://www.prepwisar.in/questions/rv8aKurpvz)

Q107 JEE Main 2023 · 24 Jan · Shift 1

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

- (A) $2 - e$ (B) 3
(C) 1 (D) e

Step-by-step solution ► [prepwisar.in/questions/DgvSkfK_jl](https://www.prepwisar.in/questions/DgvSkfK_jl)

Q108 JEE Main 2022 · 29 Jul · Shift 2

Let $y = y(x)$ be the solution curve of the differential equation

$$\frac{dy}{dx} + \left(\frac{2x^2 + 11x + 13}{x^3 + 6x^2 + 11x + 6} \right) y = \frac{(x+3)}{x+1}, x > -1$$

, which passes through the point $(0, 1)$. Then $y(1)$ is equal to :

- (A) $\frac{1}{2}$ (B) $\frac{3}{2}$
(C) $\frac{5}{2}$ (D) $\frac{7}{2}$

Step-by-step solution ► [prepwisar.in/questions/XshYn7eOgd](https://www.prepwisar.in/questions/XshYn7eOgd)

Q109 JEE Main 2022 · 29 Jul · Shift 1

Let the solution curve $y = y(x)$ of the differential equation

$$(1 + e^{2x}) \left(\frac{dy}{dx} + y \right) = 1$$

pass through the point $(0, \frac{\pi}{2})$. Then, $\lim_{x \rightarrow \infty} e^x y(x)$ is equal to :

- (A) $\frac{\pi}{4}$ (B) $\frac{3\pi}{4}$
(C) $\frac{\pi}{2}$ (D) $\frac{3\pi}{2}$

Step-by-step solution ► [prepwisar.in/questions/Dje6qLcqXp](https://www.prepwisar.in/questions/Dje6qLcqXp)

Q110 JEE Main 2022 · 28 Jul · Shift 1

If $y = y(x)$, $x \in (0, \pi/2)$ be the solution curve of the differential equation

$$(\sin^2 2x) \frac{dy}{dx} + (8 \sin^2 2x + 2 \sin 4x) y = 2e^{-4x}(2 \sin 2x + \cos 2x)$$

,

with $y(\pi/4) = e^{-\pi}$, then $y(\pi/6)$ is equal to :

- (A) $\frac{2}{\sqrt{3}}e^{-2\pi/3}$
(B) $\frac{2}{\sqrt{3}}e^{2\pi/3}$
(C) $\frac{1}{\sqrt{3}}e^{-2\pi/3}$
(D) $\frac{1}{\sqrt{3}}e^{2\pi/3}$

[Step-by-step solution ► prepwisser.in/questions/5I5rLUauVQ](https://www.prepwisser.in/questions/5I5rLUauVQ)

Q111 JEE Main 2022 · 28 Jul · Shift 2

Let $y = y(x)$ be the solution curve of the differential equation $\frac{dy}{dx} + \frac{1}{x^2-1}y = \left(\frac{x-1}{x+1}\right)^{1/2}$, $x > 1$ passing through the point $\left(2, \sqrt{\frac{1}{3}}\right)$. Then $\sqrt{7}y(8)$ is equal to :

- (A) $11 + 6 \log_e 3$ (B) 19
(C) $12 - 2 \log_e 3$ (D) $19 - 6 \log_e 3$

[Step-by-step solution ► prepwisser.in/questions/An-9k98mtR](https://www.prepwisser.in/questions/An-9k98mtR)

Q112 JEE Main 2022 · 27 Jul · Shift 1

Let $y = y(x)$ be the solution curve of the differential equation

$$\sin(2x^2) \log_e(\tan x^2) dy + \left(4xy - 4\sqrt{2}x \sin\left(x^2 - \frac{\pi}{4}\right)\right) dx = 0$$

, $0 < x < \sqrt{\frac{\pi}{2}}$, which passes through the point $\left(\sqrt{\frac{\pi}{6}}, 1\right)$. Then $|y(\sqrt{\frac{\pi}{3}})|$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/ymEAzSYhFN](https://www.prepwisser.in/questions/ymEAzSYhFN)

Q113 JEE Main 2022 · 27 Jul · Shift 1

Let $y = y_1(x)$ and $y = y_2(x)$ be two distinct solutions of the differential equation $\frac{dy}{dx} = x + y$, with $y_1(0) = 0$ and $y_2(0) = 1$ respectively. Then, the number of points of intersection of $y = y_1(x)$ and $y = y_2(x)$ is

- (A) 0 (B) 1
(C) 2 (D) 3

[Step-by-step solution ► prepwisser.in/questions/SNoGZzZj_c](https://www.prepwisser.in/questions/SNoGZzZj_c)

Q114 JEE Main 2022 · 26 Jul · Shift 2

Let the solution curve $y = f(x)$ of the differential equation $\frac{dy}{dx} + \frac{xy}{x^2-1} = \frac{x^4+2x}{\sqrt{1-x^2}}$, $x \in (-1, 1)$ pass through the origin. Then $\int_{-\frac{\sqrt{3}}{2}}^{\frac{\sqrt{3}}{2}} f(x)dx$ is equal to

(A) $\frac{\pi}{3} - \frac{1}{4}$

(B) $\frac{\pi}{3} - \frac{\sqrt{3}}{4}$

(C) $\frac{\pi}{6} - \frac{\sqrt{3}}{4}$

(D) $\frac{\pi}{6} - \frac{\sqrt{3}}{2}$

[Step-by-step solution ► prepwiser.in/questions/PiKShiHOQI](https://www.prepwiser.in/questions/PiKShiHOQI)

Q115 JEE Main 2022 · 26 Jul · Shift 2

Suppose $y = y(x)$ be the solution curve to the differential equation $\frac{dy}{dx} - y = 2 - e^{-x}$ such that $\lim_{x \rightarrow \infty} y(x)$ is finite. If a and b are respectively the x - and y -intercepts of the tangent to the curve at $x = 0$, then the value of $a - 4b$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/wlnK_QXoLd](https://www.prepwiser.in/questions/wlnK_QXoLd)

Q116 JEE Main 2022 · 26 Jul · Shift 1

If $\frac{dy}{dx} + 2y \tan x = \sin x$, $0 < x < \frac{\pi}{2}$ and $y\left(\frac{\pi}{3}\right) = 0$, then the maximum value of $y(x)$ is :

(A) $\frac{1}{8}$

(B) $\frac{3}{4}$

(C) $\frac{1}{4}$

(D) $\frac{3}{8}$

[Step-by-step solution ► prepwiser.in/questions/Dzj23uaxxb](https://www.prepwiser.in/questions/Dzj23uaxxb)

Q117 JEE Main 2022 · 29 Jun · Shift 2

Let $y = y(x)$, $x > 1$, be the solution of the differential equation $(x-1)\frac{dy}{dx} + 2xy = \frac{1}{x-1}$, with $y(2) = \frac{1+e^4}{2e^4}$. If $y(3) = \frac{e^\alpha+1}{\beta e^\alpha}$, then the value of $\alpha + \beta$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/7VnHyQvTDo](https://www.prepwiser.in/questions/7VnHyQvTDo)

Q118 JEE Main 2022 · 29 Jun · Shift 1

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

$$\frac{dy}{dx} + \frac{\sqrt{2}y}{2\cos^4 x - \cos^2 x} = xe^{\tan^{-1}(\sqrt{2}\cot 2x)}, \quad 0 < x < \frac{\pi}{2}$$

with $y\left(\frac{\pi}{4}\right) = \frac{\pi^2}{32}$. If

$$y\left(\frac{\pi}{3}\right) = \frac{\pi^2}{18}e^{-\tan^{-1}(\alpha)}$$

, then the value of $3\alpha^2$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/u_7qGwpPiY](https://www.prepwiser.in/questions/u_7qGwpPiY)

Q119 JEE Main 2022 · 28 Jun · Shift 2

Let the slope of the tangent to a curve $y = f(x)$ at (x, y) be given by $2 \tan x(\cos x - y)$. If the curve passes through the point $(\frac{\pi}{4}, 0)$, then the value of $\int_0^{\pi/2} y \, dx$ is equal to :

- (A) $(2 - \sqrt{2}) + \frac{\pi}{\sqrt{2}}$
- (B) $2 - \frac{\pi}{\sqrt{2}}$
- (C) $(2 + \sqrt{2}) + \frac{\pi}{\sqrt{2}}$
- (D) $2 + \frac{\pi}{\sqrt{2}}$

[Step-by-step solution ► prepwisser.in/questions/tYkwoa2722](https://www.prepwisser.in/questions/tYkwoa2722)

Q120 JEE Main 2022 · 28 Jun · Shift 1

Let $y = y(x)$ be the solution of the differential equation $x(1 - x^2)\frac{dy}{dx} + (3x^2y - y - 4x^3) = 0$, $x > 1$, with $y(2) = -2$. Then $y(3)$ is equal to :

- (A) -18
- (B) -12
- (C) -6
- (D) -3

[Step-by-step solution ► prepwisser.in/questions/zRpVOEyaHV](https://www.prepwisser.in/questions/zRpVOEyaHV)

Q121 JEE Main 2022 · 27 Jun · Shift 2

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

$$(1 - x^2)dy = (xy + (x^3 + 2)\sqrt{1 - x^2}) \, dx, -1 < x < 1$$

, and $y(0) = 0$. If $\int_{-\frac{1}{2}}^{\frac{1}{2}} \sqrt{1 - x^2}y(x) \, dx = k$, then k^{-1} is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/0LMDSrQb2k](https://www.prepwisser.in/questions/0LMDSrQb2k)

Q122 JEE Main 2022 · 26 Jun · Shift 1

Let the solution curve $y = y(x)$ of the differential equation

$(4 + x^2)dy - 2x(x^2 + 3y + 4)dx = 0$ pass through the origin. Then $y(2)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/8EE8uPBMTp](https://www.prepwisser.in/questions/8EE8uPBMTp)

Q123 JEE Main 2022 · 26 Jun · Shift 2

If $y = y(x)$ is the solution of the differential equation

$x \frac{dy}{dx} + 2y = x e^x$, $y(1) = 0$ then the local maximum value

of the function $z(x) = x^2y(x) - e^x$, $x \in R$ is :

- (A) $1 - e$
- (B) 0
- (C) $\frac{1}{2}$
- (D) $\frac{4}{e} - e$

[Step-by-step solution ► prepwisser.in/questions/TGEEyi2YoM](https://www.prepwisser.in/questions/TGEEyi2YoM)

Q124 JEE Main 2022 · 26 Jun · Shift 2

If the solution of the differential equation

$$\frac{dy}{dx} + e^x (x^2 - 2) y = (x^2 - 2x) (x^2 - 2) e^{2x}$$

satisfies $y(0) = 0$, then the value of $y(2)$ is _____.

- (A) -1 (B) 1
(C) 0 (D) e

[Step-by-step solution ► prepwisser.in/questions/E5MbMt_5YB](https://www.prepwisser.in/questions/E5MbMt_5YB)

Q125 JEE Main 2022 · 25 Jun · Shift 1

Let $y = y(x)$ be the solution of the differential equation $(x + 1)y' - y = e^{3x}(x + 1)^2$, with $y(0) = \frac{1}{3}$. Then, the point $x = -\frac{4}{3}$ for the curve $y = y(x)$ is :

- (A) not a critical point (B) a point of local minima
(C) a point of local maxima (D) a point of inflection

[Step-by-step solution ► prepwisser.in/questions/aDedxQbTVP](https://www.prepwisser.in/questions/aDedxQbTVP)

Q126 JEE Main 2022 · 24 Jun · Shift 1

If $x = x(y)$ is the solution of the differential equation

$y \frac{dx}{dy} = 2x + y^3(y + 1)e^y$, $x(1) = 0$; then $x(e)$ is equal to :

- (A) $e^3(e^e - 1)$ (B) $e^e(e^3 - 1)$
(C) $e^2(e^e + 1)$ (D) $e^e(e^2 - 1)$

[Step-by-step solution ► prepwisser.in/questions/GNBzW6tft6](https://www.prepwisser.in/questions/GNBzW6tft6)

Q127 JEE Main 2021 · 1 Sep · Shift 2

If $y = y(x)$ is the solution curve of the differential equation $x^2 dy + (y - \frac{1}{x}) dx = 0$; $x > 0$ and $y(1) = 1$, then $y(\frac{1}{2})$ is equal to :

- (A) $\frac{3}{2} - \frac{1}{\sqrt{e}}$ (B) $3 + \frac{1}{\sqrt{e}}$
(C) $3 + e$ (D) $3 - e$

[Step-by-step solution ► prepwisser.in/questions/8A4ydgH2jy](https://www.prepwisser.in/questions/8A4ydgH2jy)

Q128 JEE Main 2021 · 31 Aug · Shift 1

If $x\phi(x) = \int_5^x (3t^2 - 2\phi'(t))dt$, $x > -2$, and $\phi(0) = 4$, then $\phi(2)$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/6h6BVOrcK5](https://www.prepwisser.in/questions/6h6BVOrcK5)

Q129 JEE Main 2021 · 27 Aug · Shift 1

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

$\frac{dy}{dx} = 2(y + 2 \sin x - 5)x - 2 \cos x$ such that $y(0) = 7$. Then $y(\pi)$ is equal to :

(A) $2e^{\pi^2} + 5$

(B) $e^{\pi^2} + 5$

(C) $3e^{\pi^2} + 5$

(D) $7e^{\pi^2} + 5$

[Step-by-step solution ► prepwiser.in/questions/ERkkJ8a8rL](https://www.prepwiser.in/questions/ERkkJ8a8rL)

Q130 JEE Main 2021 · 27 Aug · Shift 1

If $y^{1/4} + y^{-1/4} = 2x$, and

$(x^2 - 1)\frac{d^2y}{dx^2} + \alpha x \frac{dy}{dx} + \beta y = 0$, then $|\alpha - \beta|$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/bvLRj-ygVH](https://www.prepwiser.in/questions/bvLRj-ygVH)

Q131 JEE Main 2021 · 27 Aug · Shift 1

Let us consider a curve, $y = f(x)$ passing through the point $(-2, 2)$ and the slope of the tangent to the curve at any point $(x, f(x))$ is given by $f(x) + xf'(x) = x^2$. Then :

(A) $x^2 + 2xf(x) - 12 = 0$

(B) $x^3 + xf(x) + 12 = 0$

(C) $x^3 - 3xf(x) - 4 = 0$

(D) $x^2 + 2xf(x) + 4 = 0$

[Step-by-step solution ► prepwiser.in/questions/G32qH-Qcak](https://www.prepwiser.in/questions/G32qH-Qcak)

Q132 JEE Main 2021 · 26 Aug · Shift 1

Let $y = y(x)$ be a solution curve of the differential equation $(y + 1)\tan^2 x dx + \tan x dy + y dx = 0$, $x \in (0, \frac{\pi}{2})$. If $\lim_{x \rightarrow 0^+} xy(x) = 1$, then the value of $y(\frac{\pi}{4})$ is :

(A) $-\frac{\pi}{4}$

(B) $\frac{\pi}{4} - 1$

(C) $\frac{\pi}{4} + 1$

(D) $\frac{\pi}{4}$

[Step-by-step solution ► prepwiser.in/questions/KKeczz620x](https://www.prepwiser.in/questions/KKeczz620x)

Q133 JEE Main 2021 · 26 Aug · Shift 2

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

$2x^2 dy + (e^y - 2x)dx = 0$, $x > 0$. If $y(e) = 1$, then $y(1)$ is equal to :

(A) 0

(B) 2

(C) $\log_e 2$

(D) $\log_e (2e)$

[Step-by-step solution ► prepwiser.in/questions/Yrm5aFke8v](https://www.prepwiser.in/questions/Yrm5aFke8v)

Q134 JEE Main 2021 · 27 Jul · Shift 2

Let $y = y(x)$ be the solution of the differential

equation $(x - x^3)dy = (y + yx^2 - 3x^4)dx$, $x > 2$. If $y(3) = 3$, then $y(4)$ is equal to :

- (A) 4 (B) 12
(C) 8 (D) 16

[Step-by-step solution ► prepwiser.in/questions/LtS9VT96Yh](https://www.prepwiser.in/questions/LtS9VT96Yh)

Q135 JEE Main 2021 · 25 Jul · Shift 2

Let $y = y(x)$ be the solution of the differential

equation $xdy = (y + x^3 \cos x)dx$ with $y(\pi) = 0$, then $y\left(\frac{\pi}{2}\right)$ is equal to :

- (A) $\frac{\pi^2}{4} + \frac{\pi}{2}$ (B) $\frac{\pi^2}{2} + \frac{\pi}{4}$
(C) $\frac{\pi^2}{2} - \frac{\pi}{4}$ (D) $\frac{\pi^4}{4} - \frac{\pi}{2}$

[Step-by-step solution ► prepwiser.in/questions/ZPTIKXrIsB](https://www.prepwiser.in/questions/ZPTIKXrIsB)

Q136 JEE Main 2021 · 22 Jul · Shift 2

Let $y = y(x)$ be the solution of the differential equation $\cos e^{c^2 x} dy + 2dx = (1 + y \cos 2x) \cos e^{c^2 x} dx$, with $y\left(\frac{\pi}{4}\right) = 0$. Then, the value of $(y(0) + 1)^2$ is equal to :

- (A) $e^{1/2}$
(B) $e^{-1/2}$
(C) e^{-1}
(D) e

[Step-by-step solution ► prepwiser.in/questions/u5rCcX40Ao](https://www.prepwiser.in/questions/u5rCcX40Ao)

Q137 JEE Main 2021 · 20 Jul · Shift 2

Let $y = y(x)$ satisfies the equation $\frac{dy}{dx} - |A| = 0$, for all $x > 0$, where

$$A = \begin{bmatrix} y & \sin x & 1 \\ 0 & -1 & 1 \\ 2 & 0 & \frac{1}{x} \end{bmatrix}$$

. If $y(\pi) = \pi + 2$, then the value of $y\left(\frac{\pi}{2}\right)$ is :

- (A) $\frac{\pi}{2} + \frac{4}{\pi}$ (B) $\frac{\pi}{2} - \frac{1}{\pi}$
(C) $\frac{3\pi}{2} - \frac{1}{\pi}$ (D) $\frac{\pi}{2} - \frac{4}{\pi}$

[Step-by-step solution ► prepwiser.in/questions/J_pKVjt7nh](https://www.prepwiser.in/questions/J_pKVjt7nh)

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

$$\cos x(3 \sin x + \cos x + 3)dy = (1 + y \sin x(3 \sin x + \cos x + 3))dx, 0 \leq x \leq \frac{\pi}{2}, y(0) = 0$$

. Then, $y\left(\frac{\pi}{3}\right)$ is equal to :

- (A) $2\log_e\left(\frac{\sqrt{3}+7}{2}\right)$
 (B) $2\log_e\left(\frac{3\sqrt{3}-8}{4}\right)$
 (C) $2\log_e\left(\frac{2\sqrt{3}+10}{11}\right)$
 (D) $2\log_e\left(\frac{2\sqrt{3}+9}{6}\right)$

[Step-by-step solution ► prepwiser.in/questions/70ih1mU9Ph](https://www.prepwiser.in/questions/70ih1mU9Ph)

If the curve $y = y(x)$ is the solution of the differential equation

$$2(x^2 + x^{5/4})dy - y(x + x^{1/4})dx = 2x^{9/4}dx, x > 0 \text{ which}$$

passes through the point $(1, 1 - \frac{4}{3}\log_e 2)$, then the value of $y(16)$ is equal to :

- (A) $4\left(\frac{31}{3} - \frac{8}{3}\log_e 3\right)$
 (B) $\left(\frac{31}{3} - \frac{8}{3}\log_e 3\right)$
 (C) $\left(\frac{31}{3} + \frac{8}{3}\log_e 3\right)$
 (D) $4\left(\frac{31}{3} + \frac{8}{3}\log_e 3\right)$

[Step-by-step solution ► prepwiser.in/questions/w4RJulc8or](https://www.prepwiser.in/questions/w4RJulc8or)

If $y = y(x)$ is the solution of the differential equation,

$$\frac{dy}{dx} + 2y \tan x = \sin x, y\left(\frac{\pi}{3}\right) = 0, \text{ then the maximum value of the function } y(x) \text{ over } R \text{ is equal to:}$$

- (A) $\frac{1}{8}$
 (B) 8
 (C) $-\frac{15}{4}$
 (D) $\frac{1}{2}$

[Step-by-step solution ► prepwiser.in/questions/0Qa_JTpwwu](https://www.prepwiser.in/questions/0Qa_JTpwwu)

Q141 JEE Main 2021 · 16 Mar · Shift 2

If $y = y(x)$ is the solution of the differential equation

$\frac{dy}{dx} + (\tan x)y = \sin x$, $0 \leq x \leq \frac{\pi}{3}$, with $y(0) = 0$, then $y\left(\frac{\pi}{4}\right)$ equal to :

- (A) $\frac{1}{2} \log_e 2$
- (B) $\left(\frac{1}{2\sqrt{2}}\right) \log_e 2$
- (C) $\log_e 2$
- (D) $\frac{1}{4} \log_e 2$

[Step-by-step solution ► prepwiser.in/questions/IHI0q89YMd](https://www.prepwiser.in/questions/IHI0q89YMd)

Q142 JEE Main 2021 · 26 Feb · Shift 1

If $y = y(x)$ is the solution of the equation

$e^{\sin y} \cos y \frac{dy}{dx} + e^{\sin y} \cos x = \cos x$, $y(0) = 0$; then

$$1 + y\left(\frac{\pi}{6}\right) + \frac{\sqrt{3}}{2}y\left(\frac{\pi}{3}\right) + \frac{1}{\sqrt{2}}y\left(\frac{\pi}{4}\right)$$

is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/INW_JT5FsD](https://www.prepwiser.in/questions/INW_JT5FsD)

Q143 JEE Main 2021 · 26 Feb · Shift 2

Let slope of the tangent line to a curve at any point $P(x, y)$ be given by $\frac{xy^2+y}{x}$. If the curve intersects the line $x + 2y = 4$ at $x = -2$, then the value of y , for which the point $(3, y)$ lies on the curve, is :

- (A) $-\frac{18}{19}$
- (B) $-\frac{4}{3}$
- (C) $\frac{18}{35}$
- (D) $-\frac{18}{11}$

[Step-by-step solution ► prepwiser.in/questions/WE4M7ApEar](https://www.prepwiser.in/questions/WE4M7ApEar)

Q144 JEE Main 2021 · 25 Feb · Shift 1

If a curve passes through the origin and the slope of the tangent to it at any point (x, y) is $\frac{x^2-4x+y+8}{x-2}$, then this curve also passes through the point :

- (A) (4, 4)
- (B) (5, 5)
- (C) (5, 4)
- (D) (4, 5)

[Step-by-step solution ► prepwiser.in/questions/-JW9xOvNNC](https://www.prepwiser.in/questions/-JW9xOvNNC)

Q145 JEE Main 2021 · 24 Feb · Shift 1

The population $P = P(t)$ at time 't' of a certain species follows the differential equation

$\frac{dP}{dt} = 0.5P - 450$. If $P(0) = 850$, then the time at which population becomes zero is :

- (A) $\log_e 18$
- (B) $\frac{1}{2} \log_e 18$
- (C) $2 \log_e 18$
- (D) $\log_e 9$

[Step-by-step solution ► prepwiser.in/questions/at3qpdwgH9](https://www.prepwiser.in/questions/at3qpdwgH9)

Q146 JEE Main 2021 · 24 Feb · Shift 2

If a curve $y = f(x)$ passes through the point $(1, 2)$ and satisfies $x \frac{dy}{dx} + y = bx^4$, then for what value of b ,
 $\int_1^2 f(x) dx = \frac{62}{5}$?

- (A) $\frac{31}{5}$ (B) 10
(C) 5 (D) $\frac{62}{5}$

[Step-by-step solution ► prepwiser.in/questions/mxNSyWvg75](https://www.prepwiser.in/questions/mxNSyWvg75)

Q147 JEE Main 2020 · 6 Sep · Shift 2

If $y = \left(\frac{2}{\pi}x - 1\right) \operatorname{cosec} x$ is the solution of the differential equation,

$$\frac{dy}{dx} + p(x)y = \frac{2}{\pi} \operatorname{cosec} x,$$

$0 < x < \frac{\pi}{2}$, then the function $p(x)$ is equal to :

- (A) $\cot x$ (B) $\sec x$
(C) $\tan x$ (D) $\operatorname{cosec} x$

[Step-by-step solution ► prepwiser.in/questions/RayRcL0cDZ](https://www.prepwiser.in/questions/RayRcL0cDZ)

Q148 JEE Main 2020 · 5 Sep · Shift 2

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

$$\cos x \frac{dy}{dx} + 2y \sin x = \sin 2x, x \in \left(0, \frac{\pi}{2}\right).$$

If $y\left(\frac{\pi}{3}\right) = 0$, then $y\left(\frac{\pi}{4}\right)$ is equal to :

- (A) $\frac{1}{\sqrt{2}} - 1$ (B) $\sqrt{2} - 2$
(C) $2 - \sqrt{2}$ (D) $2 + \sqrt{2}$

[Step-by-step solution ► prepwiser.in/questions/5A_8MS5N8d](https://www.prepwiser.in/questions/5A_8MS5N8d)

Q149 JEE Main 2020 · 4 Sep · Shift 1

Let $y = y(x)$ be the solution of the differential equation,

$$xy' - y = x^2(x \cos x + \sin x), x > 0. \text{ if } y(\pi) = \pi \text{ then}$$

$y''\left(\frac{\pi}{2}\right) + y\left(\frac{\pi}{2}\right)$ is equal to :

- (A) $1 + \frac{\pi}{2}$
(B) $2 + \frac{\pi}{2} + \frac{\pi^2}{4}$
(C) $2 + \frac{\pi}{2}$
(D) $1 + \frac{\pi}{2} + \frac{\pi^2}{4}$

[Step-by-step solution ► prepwiser.in/questions/P9I9AsPev5](https://www.prepwiser.in/questions/P9I9AsPev5)

Q150 JEE Main 2020 · 9 Jan · Shift 1

If for $x \geq 0$, $y = y(x)$ is the solution of the differential equation

$$(x + 1)dy = ((x + 1)^2 + y - 3)dx, y(2) = 0, \text{ then } y(3) \text{ is equal to } \underline{\hspace{2cm}}.$$

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/9Cf55ml7Bf](https://www.prepwiser.in/questions/9Cf55ml7Bf)

Q151 JEE Main 2020 · 7 Jan · Shift 2

Let $y = y(x)$ be the solution curve of the differential equation,

$(y^2 - x) \frac{dy}{dx} = 1$, satisfying $y(0) = 1$. This curve intersects the x-axis at a point whose abscissa is :

- (A) $2 + e$ (B) $-e$
(C) 2 (D) $2 - e$

[Step-by-step solution ► prepwiser.in/questions/s4yYMp3yT3](https://www.prepwiser.in/questions/s4yYMp3yT3)

Homogeneous Equations · 23 PYQs

Q152 JEE Main 2024 · 9 Apr · Shift 1

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

- (A) $|x^2 - 4y^2|^5 = x^2$ (B) $|x^2 - 2y^2|^6 = x$
(C) $|x^2 - 2y^2|^5 = x^2$ (D) $|x^2 - 4y^2|^6 = x$

[Step-by-step solution ► prepwiser.in/questions/WjwjbpqIz](https://www.prepwiser.in/questions/WjwjbpqIz)

Q153 JEE Main 2024 · 6 Apr · Shift 2

Suppose the solution of the differential equation

$$\frac{dy}{dx} = \frac{(2 + \alpha)x - \beta y + 2}{\beta x - 2\alpha y - (\beta\gamma - 4\alpha)}$$

represents a circle passing through origin. Then the radius of this circle is :

- (A) $\sqrt{17}$ (B) 2
(C) $\frac{\sqrt{17}}{2}$ (D) $\frac{1}{2}$

[Step-by-step solution ► prepwiser.in/questions/PIHPIvvyQx](https://www.prepwiser.in/questions/PIHPIvvyQx)

Q154 JEE Main 2024 · 31 Jan · Shift 1

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

- (A) $|\log_e \frac{y}{x}| = y^2$ (B) $|\log_e \frac{y}{x}| = x$
(C) $|\log_e \frac{x}{y}| = y$ (D) $2 |\log_e \frac{x}{y}| = y + 1$

[Step-by-step solution ► prepwiser.in/questions/nojWuoACDS](https://www.prepwiser.in/questions/nojWuoACDS)

Q155 JEE Main 2024 · 29 Jan · Shift 2

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

- (A) 12 (B) 9
(C) 4 (D) 3

[Step-by-step solution ► prepwiser.in/questions/L8TgS3vFnI](https://www.prepwiser.in/questions/L8TgS3vFnI)

Q156 JEE Main 2024 · 27 Jan · Shift 2

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 _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/tycYj3wH9w](https://www.prepwiser.in/questions/tycYj3wH9w)

Q157 JEE Main 2023 · 31 Jan · Shift 2

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

$$(3y^2 - 5x^2) y dx + 2x (x^2 - y^2) dy = 0$$

such that $y(1) = 1$. Then $|(y(2))^3 - 12y(2)|$ is equal to :

(A) 64

(B) $16\sqrt{2}$

(C) 32

(D) $32\sqrt{2}$

[Step-by-step solution ► prepwiser.in/questions/sOyLuK7cMw](https://www.prepwiser.in/questions/sOyLuK7cMw)

Q158 JEE Main 2023 · 30 Jan · Shift 2

The solution of the differential equation

$$\frac{dy}{dx} = - \left(\frac{x^2 + 3y^2}{3x^2 + y^2} \right), y(1) = 0 \text{ is :}$$

(A) $\log_e |x + y| + \frac{xy}{(x+y)^2} = 0$

(B) $\log_e |x + y| - \frac{xy}{(x+y)^2} = 0$

(C) $\log_e |x + y| + \frac{2xy}{(x+y)^2} = 0$

(D) $\log_e |x + y| - \frac{2xy}{(x+y)^2} = 0$

[Step-by-step solution ► prepwiser.in/questions/J_EQ3Z8kp5](https://www.prepwiser.in/questions/J_EQ3Z8kp5)

Q159 JEE Main 2023 · 24 Jan · Shift 2

Let $y = y(x)$ be the solution of the differential equation $(x^2 - 3y^2)dx + 3xydy = 0, y(1) = 1$. Then $6y^2(e)$ is equal to

(A) $\frac{3}{2}e^2$

(B) $3e^2$

(C) e^2

(D) $2e^2$

[Step-by-step solution ► prepwiser.in/questions/nGudHlT_I](https://www.prepwiser.in/questions/nGudHlT_I)

Q160 JEE Main 2022 · 29 Jul · Shift 2

If the solution curve of the differential equation $\frac{dy}{dx} = \frac{x+y-2}{x-y}$ passes through the points (2, 1) and (k + 1, 2), $k > 0$, then

(A) $2 \tan^{-1} \left(\frac{1}{k} \right) = \log_e (k^2 + 1)$

(B) $\tan^{-1} \left(\frac{1}{k} \right) = \log_e (k^2 + 1)$

(C) $2 \tan^{-1} \left(\frac{1}{k+1} \right) = \log_e (k^2 + 2k + 2)$

(D) $2 \tan^{-1} \left(\frac{1}{k} \right) = \log_e \left(\frac{k^2+1}{k^2} \right)$

[Step-by-step solution ► prepwiser.in/questions/LW1ChU3uLP](https://www.prepwiser.in/questions/LW1ChU3uLP)

Q161 JEE Main 2022 · 28 Jul · Shift 1

Let the solution curve of the differential equation $xdy = (\sqrt{x^2 + y^2} + y) dx, x > 0$, intersect the line $x = 1$ at $y = 0$ and the line $x = 2$ at $y = \alpha$. Then the value of α is :

- (A) $\frac{1}{2}$
- (B) $\frac{3}{2}$
- (C) $-\frac{3}{2}$
- (D) $\frac{5}{2}$

[Step-by-step solution ► prepwiser.in/questions/gVVNZIrI5O](https://www.prepwiser.in/questions/gVVNZIrI5O)

Q162 JEE Main 2022 · 25 Jul · Shift 1

The general solution of the differential equation $(x - y^2) dx + y(5x + y^2) dy = 0$ is :

- (A) $(y^2 + x)^4 = C |(y^2 + 2x)^3|$
- (B) $(y^2 + 2x)^4 = C |(y^2 + x)^3|$
- (C) $|(y^2 + x)^3| = C (2y^2 + x)^4$
- (D) $|(y^2 + 2x)^3| = C (2y^2 + x)^4$

[Step-by-step solution ► prepwiser.in/questions/x0w35h9Fax](https://www.prepwiser.in/questions/x0w35h9Fax)

Q163 JEE Main 2022 · 25 Jul · Shift 2

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

$$\frac{dy}{dx} = \frac{4y^3 + 2yx^2}{3xy^2 + x^3}, y(1) = 1.$$

If for some $n \in \mathbb{N}, y(2) \in [n - 1, n)$, then n is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/nNeq2B7LT1](https://www.prepwiser.in/questions/nNeq2B7LT1)

Q164 JEE Main 2022 · 29 Jun · Shift 1

Let the solution curve of the differential equation

$$x \frac{dy}{dx} - y = \sqrt{y^2 + 16x^2}, y(1) = 3 \text{ be } y = y(x). \text{ Then } y(2) \text{ is equal to:}$$

- | | |
|--------|--------|
| (A) 15 | (B) 11 |
| (C) 13 | (D) 17 |

[Step-by-step solution ► prepwiser.in/questions/Qm_8IfTUhX](https://www.prepwiser.in/questions/Qm_8IfTUhX)

Q165 JEE Main 2022 · 28 Jun · Shift 2

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

$$2y e^{x/y^2} dx + (y^2 - 4x e^{x/y^2}) dy = 0 \text{ such that } x(1) = 0. \text{ Then, } x(e) \text{ is equal to :}$$

- | | |
|---------------------|----------------------|
| (A) $e \log_e(2)$ | (B) $-e \log_e(2)$ |
| (C) $e^2 \log_e(2)$ | (D) $-e^2 \log_e(2)$ |

[Step-by-step solution ► prepwiser.in/questions/7t_FqPUyw4](https://www.prepwiser.in/questions/7t_FqPUyw4)

Q166 JEE Main 2022 · 28 Jun · Shift 1

Let the solution curve $y = y(x)$ of the differential equation

$$\left[\frac{x}{\sqrt{x^2 - y^2}} + e^{\frac{y}{x}} \right] x \frac{dy}{dx} = x + \left[\frac{x}{\sqrt{x^2 - y^2}} + e^{\frac{y}{x}} \right] y$$

pass through the points $(1, 0)$ and $(2\alpha, \alpha)$, $\alpha > 0$. Then α is equal to

- (A) $\frac{1}{2} \exp\left(\frac{\pi}{6} + \sqrt{e} - 1\right)$
(B) $\frac{1}{2} \exp\left(\frac{\pi}{6} + e - 1\right)$
(C) $\exp\left(\frac{\pi}{6} + \sqrt{e} + 1\right)$
(D) $2 \exp\left(\frac{\pi}{3} + \sqrt{e} - 1\right)$

Step-by-step solution ► [prepwisar.in/questions/bVdLKWWUtG](https://www.prepwisar.in/questions/bVdLKWWUtG)

Q167 JEE Main 2022 · 25 Jun · Shift 2

If $y = y(x)$ is the solution of the differential equation

$2x^2 \frac{dy}{dx} - 2xy + 3y^2 = 0$ such that $y(e) = \frac{e}{3}$, then $y(1)$ is equal to :

- (A) $\frac{1}{3}$ (B) $\frac{2}{3}$
(C) $\frac{3}{2}$ (D) 3

Step-by-step solution ► [prepwisar.in/questions/EBW8icgmEd](https://www.prepwisar.in/questions/EBW8icgmEd)

Q168 JEE Main 2022 · 25 Jun · Shift 1

If the solution curve $y = y(x)$ of the differential equation $y^2 dx + (x^2 - xy + y^2) dy = 0$, which passes through the point $(1, 1)$ and intersects the line $y = \sqrt{3}x$ at the point $(\alpha, \sqrt{3}\alpha)$, then value of $\log_e(\sqrt{3}\alpha)$ is equal to :

- (A) $\frac{\pi}{3}$ (B) $\frac{\pi}{2}$
(C) $\frac{\pi}{12}$ (D) $\frac{\pi}{6}$

Step-by-step solution ► [prepwisar.in/questions/dq1R-MFbag](https://www.prepwisar.in/questions/dq1R-MFbag)

Q169 JEE Main 2021 · 31 Aug · Shift 2

If

$$y \frac{dy}{dx} = x \left[\frac{y^2}{x^2} + \frac{\phi\left(\frac{y^2}{x^2}\right)}{\phi'\left(\frac{y^2}{x^2}\right)} \right]$$

, $x > 0$, $\phi > 0$, and $y(1) = -1$, then $\phi\left(\frac{y^2}{4}\right)$ is equal to :

- (A) $4\phi(2)$ (B) $4\phi(1)$
(C) $2\phi(1)$ (D) $\phi(1)$

Step-by-step solution ► [prepwisar.in/questions/E8JyZaSrNG](https://www.prepwisar.in/questions/E8JyZaSrNG)

Q170 JEE Main 2021 · 20 Jul · Shift 1

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

$$x \tan\left(\frac{y}{x}\right) dy = \left(y \tan\left(\frac{y}{x}\right) - x\right) dx$$

, $-1 \leq x \leq 1$, $y\left(\frac{1}{2}\right) = \frac{\pi}{6}$. Then the area of the region bounded by the curves $x = 0$, $x = \frac{1}{\sqrt{2}}$ and $y = y(x)$ in the upper half plane is :

(A) $\frac{1}{8}(\pi - 1)$

(B) $\frac{1}{12}(\pi - 3)$

(C) $\frac{1}{4}(\pi - 2)$

(D) $\frac{1}{6}(\pi - 1)$

Step-by-step solution ► [prepwisser.in/questions/AldiqSUZ3w](https://www.prepwisser.in/questions/AldiqSUZ3w)

Q171 JEE Main 2021 · 18 Mar · Shift 2

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

$xdy - ydx = \sqrt{(x^2 - y^2)}dx$, $x \geq 1$, with $y(1) = 0$. If the area bounded by the line $x = 1$, $x = e^\pi$, $y = 0$ and $y = y(x)$ is $\alpha e^{2\pi} + \beta$, then the value of $10(\alpha + \beta)$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/h6fUfReTXA](https://www.prepwisser.in/questions/h6fUfReTXA)

Q172 JEE Main 2021 · 25 Feb · Shift 2

If the curve, $y = y(x)$ represented by the solution of the differential equation $(2xy^2 - y)dx + xdy = 0$, passes through the intersection of the lines, $2x - 3y = 1$ and $3x + 2y = 8$, then $|y(1)|$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/j-nj94ZAQR](https://www.prepwisser.in/questions/j-nj94ZAQR)

Q173 JEE Main 2020 · 2 Sep · Shift 2

If a curve $y = f(x)$, passing through the point $(1, 2)$, is the solution of the differential equation, $2x^2 dy = (2xy + y^2)dx$, then $f\left(\frac{1}{2}\right)$ is equal to :

(A) $\frac{1}{1 - \log_e 2}$

(B) $\frac{1}{1 + \log_e 2}$

(C) $\frac{-1}{1 + \log_e 2}$

(D) $1 + \log_e 2$

Step-by-step solution ► [prepwisser.in/questions/R7Ld_zkEt4](https://www.prepwisser.in/questions/R7Ld_zkEt4)

Q174 JEE Main 2020 · 9 Jan · Shift 2

If $\frac{dy}{dx} = \frac{xy}{x^2 + y^2}$; $y(1) = 1$; then a value of x satisfying $y(x) = e$ is :

(A) $\sqrt{2}e$

(B) $\frac{1}{2}\sqrt{3}e$

(C) $\frac{e}{\sqrt{2}}$

(D) $\sqrt{3}e$

Step-by-step solution ► [prepwisser.in/questions/PbsVRREvzY](https://www.prepwisser.in/questions/PbsVRREvzY)

Answer key — Differential Equations

Numbers match the question numbers above. For full working, open the solution link under each question.

1	B	2	D	3	2	4	D	5	A	6	D	7	B	8	C
9	D	10	4	11	3	12	31	13	D	14	D	15	14	16	9
17	A	18	3	19	29	20	A	21	A	22	C	23	A	24	C
25	12	26	D	27	A	28	A	29	B	30	A	31	27	32	6
33	B	34	90	35	C	36	B	37	D	38	42	39	D	40	A
41	B	42	D	43	2	44	2	45	A	46	4	47	1	48	4
49	B	50	2	51	D	52	C	53	B	54	D	55	C	56	A
57	A	58	D	59	D	60	D	61	C	62	C	63	B	64	C
65	B	66	C	67	A	68	A	69	36	70	21	71	B	72	D
73	4	74	1	75	19	76	D	77	C	78	27	79	D	80	61
81	D	82	B	83	A	84	C	85	18	86	24	87	D	88	7
89	5	90	B	91	C	92	B	93	97	94	B	95	B	96	B
97	6	98	A	99	A	100	3	101	2	102	1	103	D	104	B
105	D	106	A	107	C	108	B	109	B	110	A	111	D	112	1
113	A	114	B	115	3	116	A	117	14	118	2	119	B	120	A
121	320	122	12	123	D	124	C	125	B	126	A	127	D	128	4
129	A	130	17	131	C	132	D	133	C	134	B	135	A	136	C
137	A	138	C	139	A	140	A	141	B	142	1	143	A	144	B
145	C	146	B	147	A	148	B	149	C	150	3	151	D	152	A
153	C	154	C	155	D	156	11	157	D	158	C	159	D	160	A
161	B	162	A	163	3	164	A	165	D	166	A	167	B	168	C
169	B	170	A	171	4	172	1	173	B	174	D				

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