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YouTube Classes Schedule

ENGINEERS

EE & EC ENGINEERING

EXAM TARGET	SUBJECT	TIME	FACULTY
ALL PSUs	ENGINEERING MATHS	10:00 AM	ANANT SIR
GATE 2024-25	NETWORK THEORY	6:00 PM	RAVI SIR
GATE 2024-25	ELECTRICAL MACHINE	7:30 PM	SANTAN SIR
GATE 2024-25	COMMUNICATION	9:00 PM	RENU SIR

YouTube Classes Schedule

ENGINEERS

CIVIL ENGINEERING

EXAM TARGET	SUBJECT	TIME	FACULTY
ALL PSUs	ENGINEERING MATHS	10:00 AM	ANANT SIR
ALL PSUs	GEOTECHNICAL	1:00 PM	RUDRA SIR
GATE 2024-25	STEEL STRUCTURE	6.00 PM	REHAN SIR
GATE 2024-25	ENVIRONMENT	8:00 PM	PRATIK SIR
GATE 2024-25	SOM	9:00 PM	MUKESH SIR

YouTube Classes Schedule

MECHANICAL ENGINEERING

EXAM TARGET	SUBJECT	TIME	FACULTY
ALL PSUs	ENGINEERING MATHS	10:00 AM	ANANT SIR
ALL PSUs	PRODUCTION	11:30 PM	GAURAV SIR
ALL PSUs	THERMODYNAMICS	3:00 PM	KANISTH SIR
GATE 2024-25	HMT	4:30 PM	YOGESH SIR
GATE 2024-25	SOM	9:00 PM	MUKESH SIR

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MECHANICAL ENGINEERING

GATE

Prachand

Free

HMT	MONDAY Live @11AM	YOGESH SIR
PRODUCTION	TUESDAY Live @11AM	GAURAV SIR
SOM	WEDNESDAY Live @8PM	MUKESH SIR
THERMODYNAMICS	THURSDAY Live @11AM	KANISTH SIR
ENGINEERING MATHEMATICS	FRIDAY Live @11AM	ANANT SIR

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EE & ECEENGINEERING

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NETWORK THEORY	SATURDAY Live @11AM	RAVI SIR
COMMUNICATION	WEDNESDAY Live @8PM	RENU SIR
ANALOG ELECTRONICS	THURSDAY Live @8PM	LAWRENCE SIR
ENGINEERING MATHEMATICS	FRIDAY Live @11AM	ANANT SIR
ELECTRICAL MACHINE	MONDAY Live @8PM	SANTAN SIR

FREE APP CLASS SCHEDULE

CIVIL ENGINEERING

GATE

SOM	WEDNESDAY Live @8PM	MUKESH SIR
ENVIRONMENT	THURSDAY Live @8PM	PRATIK SIR
STEEL STRUCTURE	FRIDAY Live @8PM	REHAN SIR
GEOTECHNICAL	SATURDAY Live @11AM	RUDRA SIR
ENGINEERING MATHEMATICS	FRIDAY Live @11AM	ANANT SIR

Q:35 Let f be a real-valued function of a real variable defined as $f(x) = x^2$ for $x \geq 0$, and $f(x) = -x^2$ for $x < 0$. Which one of the following statements is true?

(a) f(x) is discontinuous at x = 0

(b) f(x) is continuous but not differentiable at x = 0

(c) f(x) is differentiable but its first derivative is not continuous at x = 0

(d) f(x) is differentiable but its first derivative is not differentiable at x = 0.

$$f(x) = \begin{cases} x^2 & x \geq 0 \\ -x^2 & x < 0 \end{cases}$$

L.H.L. $= \lim_{x \to 0^-} f(x) = \lim_{x \to 0^-} (-x^2) = -0$

R.H.L. $= \lim_{x \to 0^+} f(x) = \lim_{x \to 0^+} (x^2) = 0$

$f(0) = 0$

L.H.L. = R.H.L. = f(0)

⇒ continuous

L.H.D. $= \lim_{x \to 0^-} f'(x) = \lim_{x \to 0^-} (-2x) = -0$

R.H.D. $= \lim_{x \to 0^+} f'(x) = \lim_{x \to 0^+} (2x) = +0$

⇒ Differentiable

$$f'(x) = \begin{cases} 2x; & x \geq 0 \\ -2x & x \leq 0 \end{cases}$$

$$L.H.D. \neq R.H.D.$$

$$\lim_{x \to a^-} f'(x) \neq \lim_{x \to a^+} f'(x)$$

$$L.H.D. = \lim_{x \to 0^-} \frac{d}{dx}[f'(x)] = -2$$

$$L.H.L.[f'(x)] \neq R.H.L.[f'(x)]$$

$$R.H.D. = \lim_{x \to 0^+} \frac{d}{dx}[f'(x)] = 2$$

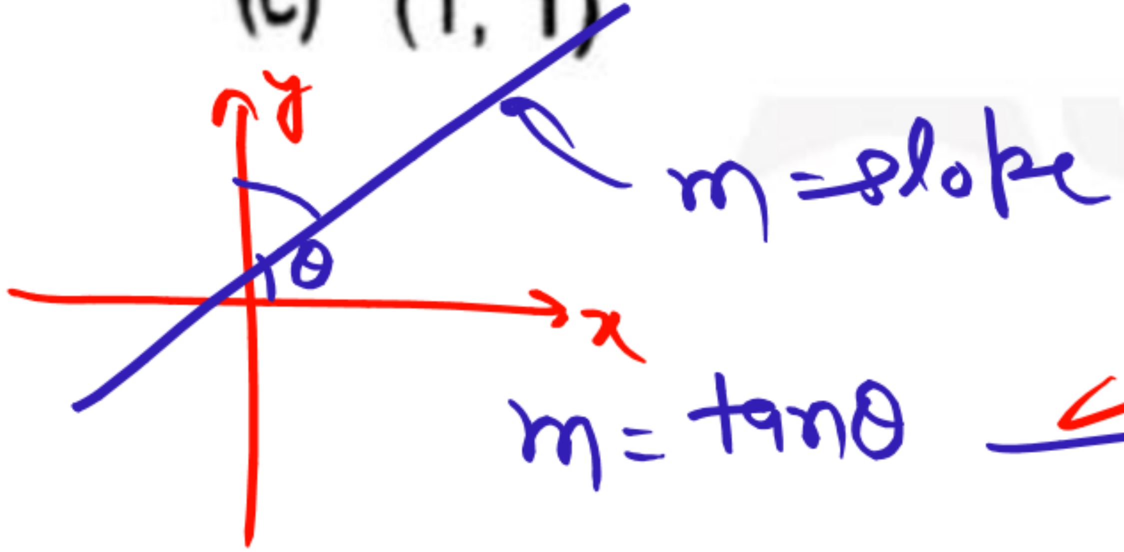
Q:36 The tangent to the curve represented by $y = x \ln x$ is required to have 45° inclination with the x-axis. The coordinates of the tangent point would be

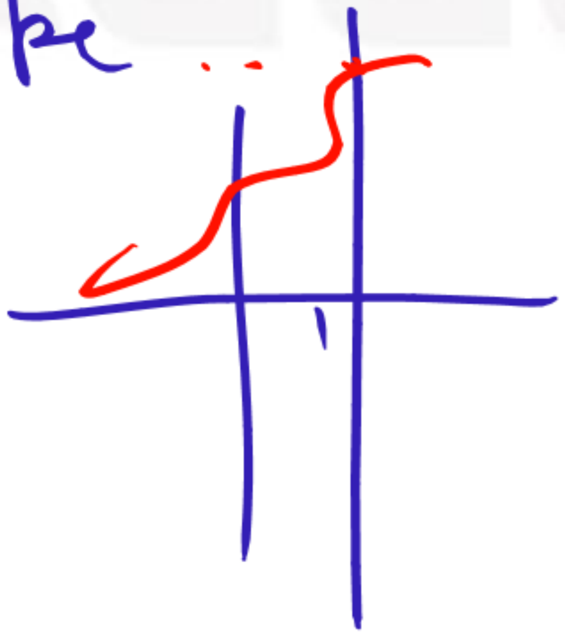
(a) (1, 0) ✓

(b) (0, 1) ✗

(c) (1, 1)

(d) $(\sqrt{2}, \sqrt{2})$





$y = f(x) = x \ln x$

slope of tangential

$\frac{dy}{dx} = m = \tan\theta$

$x \cdot \frac{1}{x} + \ln x = \tan 45°$

$1 + \ln x = 1$

$\ln x = 0$

$\Rightarrow x = 1$

$\Rightarrow y = x \ln x \big|_{x=1} = 1 \ln(1) = 0$

(1, 0)

Q:37 A function f(x) is defined as $f(x) = \begin{cases} e^x, & x < 1 \\ \ln x + ax^2 + bx & x \geq 1 \end{cases}$, where $x \in \mathbb{R}$. Which one of the following statement is TRUE?

(a) f(x) is **NOT** differentiable at x = 1 for any values of a and b.

(b) f(x) is differentiable at x = 1 for the unique value of a and b.

(c) f(x) is differentiable at x = 1 for all values of a and b such that a + b = e.

(d) f(x) is differentiable at x = 1 for all values of a and b

$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$

$L.H.L. = \lim_{x \to 1^-} f(x) = \lim_{x \to 1^-} e^x = e^1 = e$

$R.H.L. = \lim_{x \to 1^+} f(x) = a + b$

for a+b = e, function is continuous. → ①

$L.H.D. = \lim_{x \to 1^-} f'(x) = \lim_{x \to 1^-} e^x = e$

$R.H.D. = \lim_{x \to 1^+} f'(x) = 1 + 2a + b$

For L.H.D. to be equal to R.H.D.

$$1+2a+b = e$$

$$2a+b = e-1 \longrightarrow (2)$$

for function to differentiable at $x=1$

eq^n (1) & (2) both must satisfy.

$$a+b = e \quad -(1)$$

$$2a+b = e-1 \quad -(2)$$

(2) − (1)

$$a = -1 \Rightarrow b = e+1$$

$$a_1x + b_1y = c_1$$

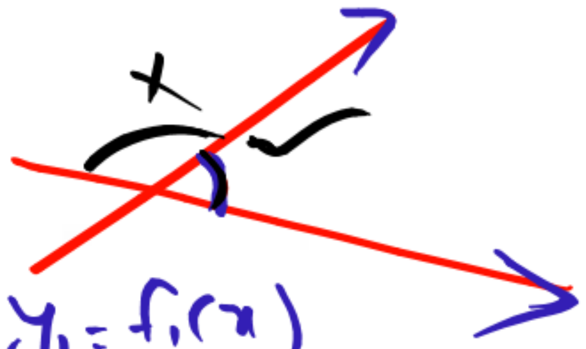
$$a_2x + b_2y = c_2$$

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

→ unique sol^n

Q: The angle of intersection of the curve $x^2 = 4y$ and $y^2 = 4x$ at point (0, 0) is

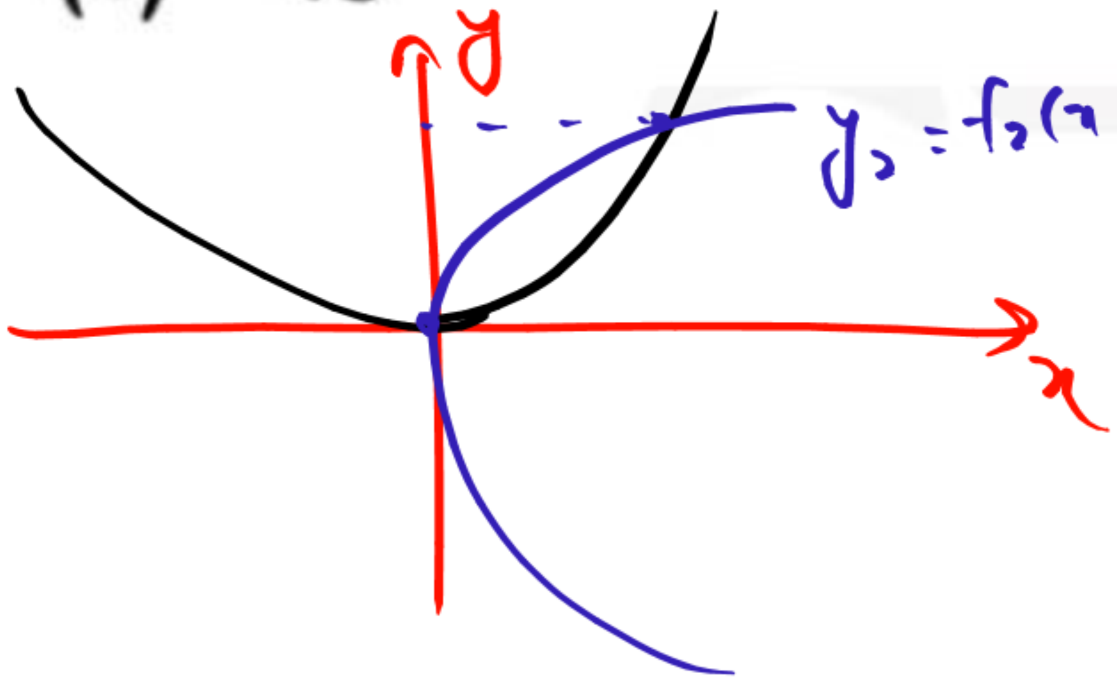
(a) 0°

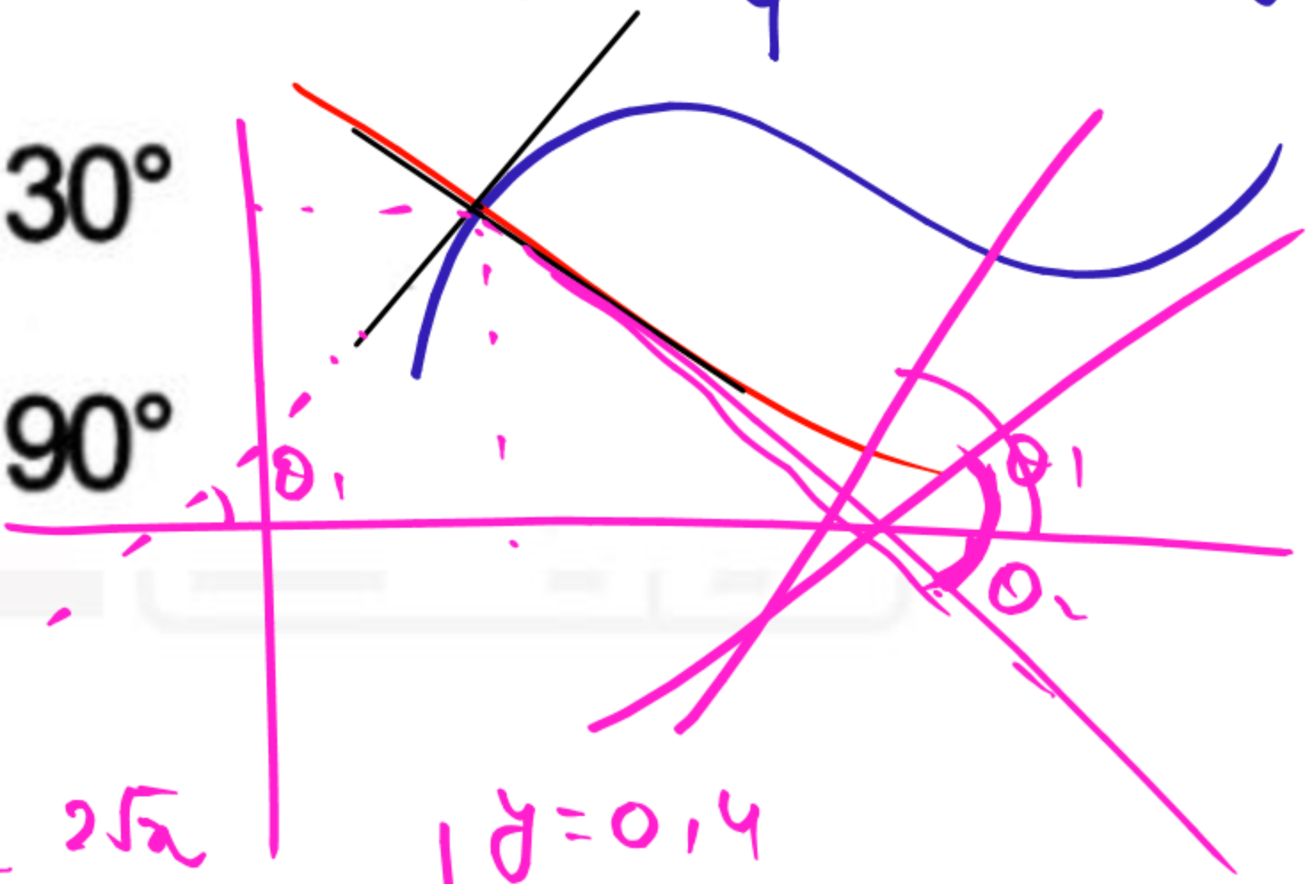


(b) 30°

(c) 45°

(d) 90°





at $(0,0)$

$$\left.\frac{dy_1}{dx}\right|_{(0,0)} = \left.\frac{x}{2}\right|_{(0,0)} = 0 = m_1 = \tan\theta_1$$

$$\Rightarrow \theta_1 = 0$$

$$\left.\frac{dy_2}{dx}\right|_{(0,0)} = \left.\frac{1}{\sqrt{x}}\right|_{(0,0)} = \infty = m_2 = \tan\theta_2$$

$$\theta_2 = 90^\circ$$

angle of intersection at $(0,0) = |\theta_1 - \theta_2| = 90^\circ$

at $(4,4)$

$$\left.\frac{dy_1}{dx}\right|_{(4,4)} = \left.\frac{x}{2}\right|_{(4,4)} = 2 = m_1$$

$\tan\theta_1 = 2$

$\theta_1 = \tan^{-1}(2)$

$$\left.\frac{dy_2}{dx}\right|_{(4,4)} = \left.\frac{1}{\sqrt{x}}\right|_{(4,4)} = \frac{1}{2} = m_2$$

$\tan\theta_2 = \frac{1}{2}$

$\theta_2 = \tan^{-1}\left(\frac{1}{2}\right)$

angle of intersection $= |\theta_1 - \theta_2| = \left[\tan^{-1}(2) - \tan^{-1}\left(\frac{1}{2}\right)\right]$

THANKS FOR

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