



DSSSB TGT

PART (A+B)



MATHS

APPLICATION OF DERIVATIVES

Part -2



10/06/2024 04:30PM



$$y = f(x)$$

$y' > 0$ increasing

$y' < 0$ decreasing

$$\# f(x) = x^3 - 3x^2 + 4x, x \in \mathbb{R}$$

it is increasing on $\mathbb{R} = ?$

$$f'(x) = 3x^2 - 6x + 4$$

$$f'(x) > 0$$

$$3x^2 - 6x + 3 + 1 > 0$$

$$3(x^2 - 2x + 1) + 1 > 0$$

$$3(x-1)^2 + 1 > 0$$

$$3(x-1)^2 + 1 \geq 0 + 1$$

$$3(x-1)^2 + 1 \geq 1$$

$$\boxed{3(x-1)^2 + 1 > 0}$$

$\Rightarrow$

$f(x) = \sin x$

interval $(0, \frac{\pi}{2})$ 42

$f'(x) = \cos x$

increasing or decreasing?

$f'(x) > 0$

$f'(x)$ is a
increasing f^n in
interval $(0, \frac{\pi}{2})$



$$\# f(x) = \cos x$$

interval $(\pi, 2\pi)$ पर increasing
or decreasing
=?

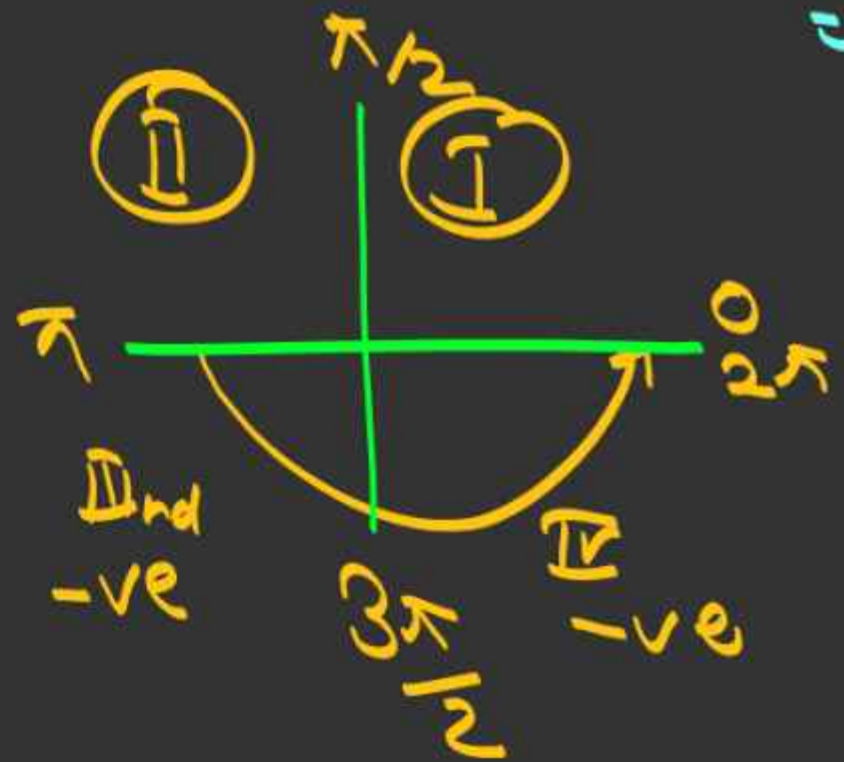
$$f'(x) = -\sin x$$

$$f'(x) = -(-)$$

= +

$$f'(x) > 0$$

$f(x)$ is an increasing
fn



$$\textcircled{1} f(x) = \cos x$$

$(0, \pi)$

$$f'(x) = -\sin x$$

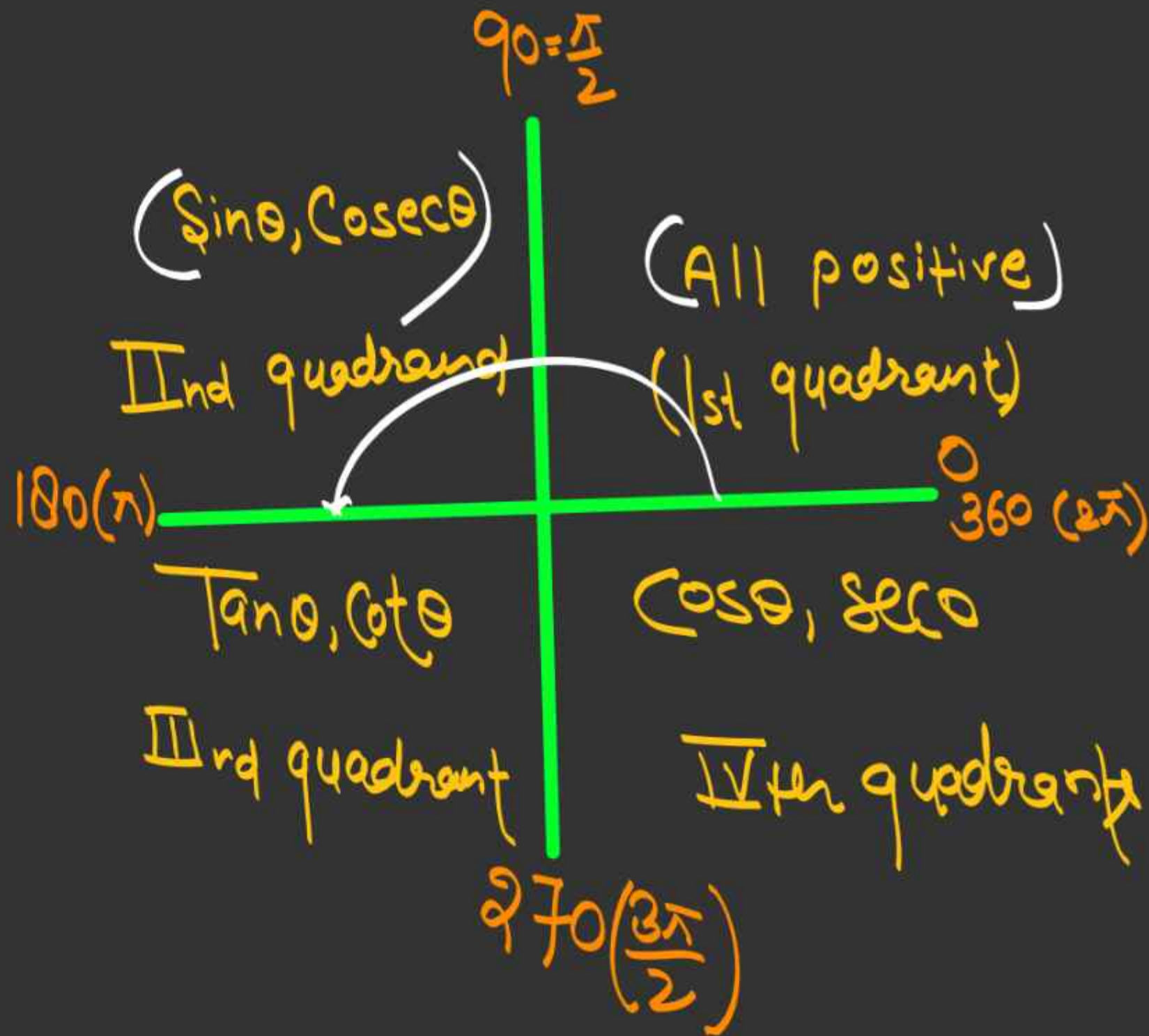
$$= -ve$$

increasing
OR

Decreasing?

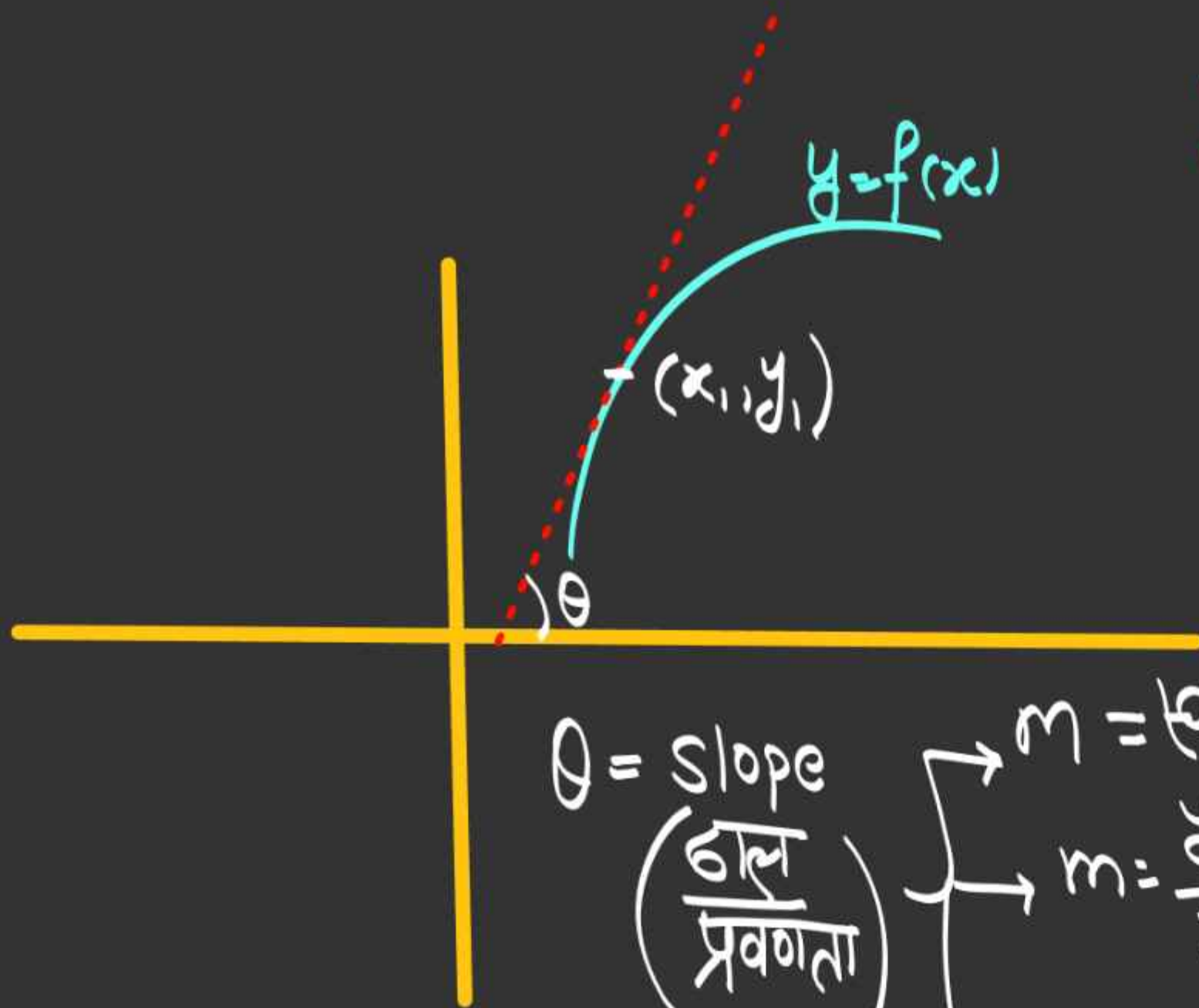
$$f'(x) < 0$$

$f(x)$ is decreasing f^n



Tangent & Normal

स्पर्श रेखा और अभिलम्ब रेखा →



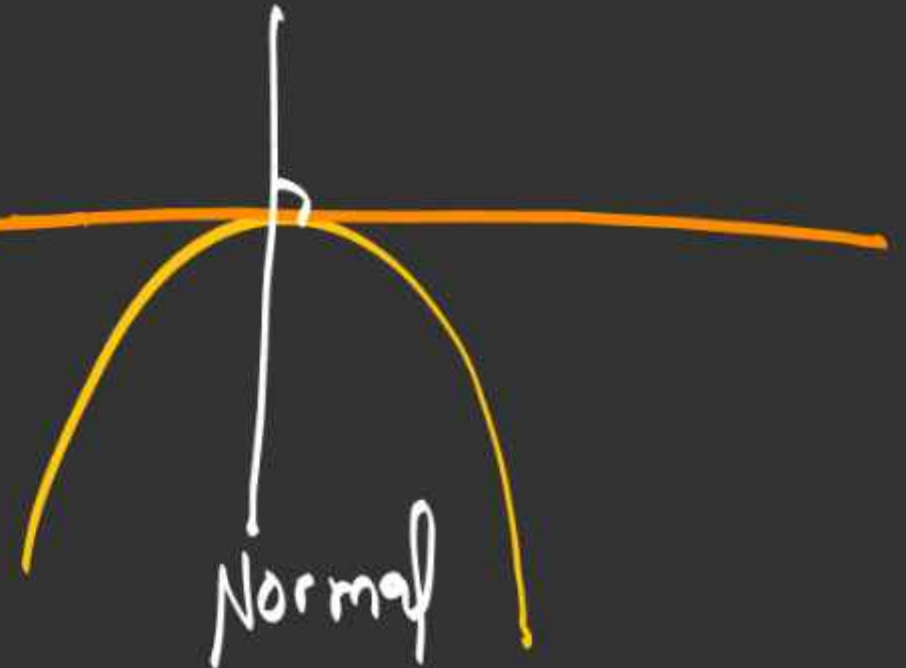
$\theta = \text{Slope}$
 $\left(\frac{\text{ढाल}}{\text{प्रवणता}} \right)$

$$m = \tan \theta$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = -\frac{a}{b}$$

Tangent



Normal
अभिलम्ब

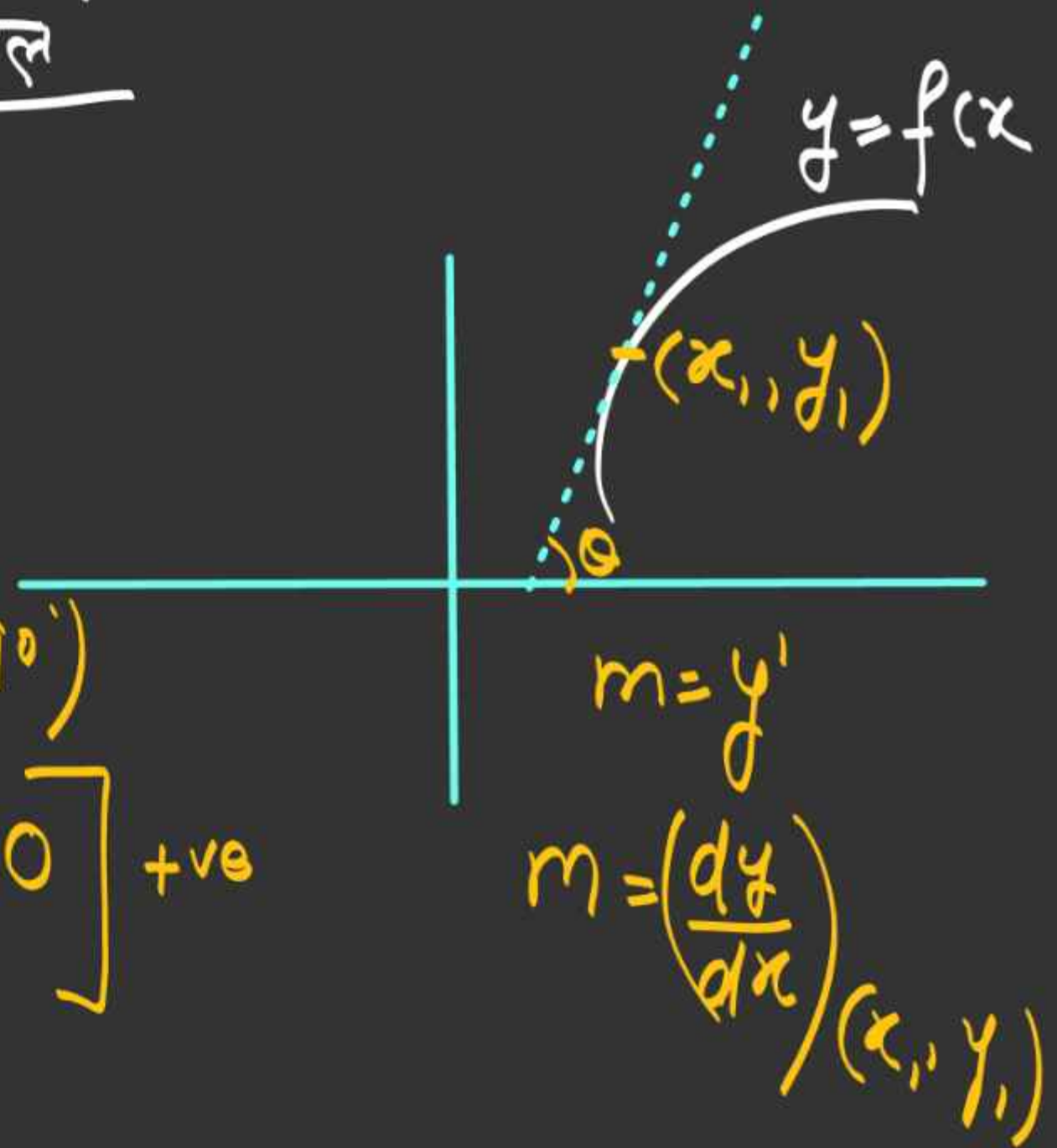
Slope of tangent $\rightarrow$
स्पर्श रेखा की प्रवणता/ढाल

* Condition $\rightarrow$

If tangent (स्पर्श रेखा) $\rightarrow$

① acute angle (ज्यूनक्रीठा) ($0^\circ - 90^\circ$)

$$\left[m = \tan \theta = \left(\frac{dy}{dx} \right)_{(x_1, y_1)} > 0 \right]_{+ve}$$

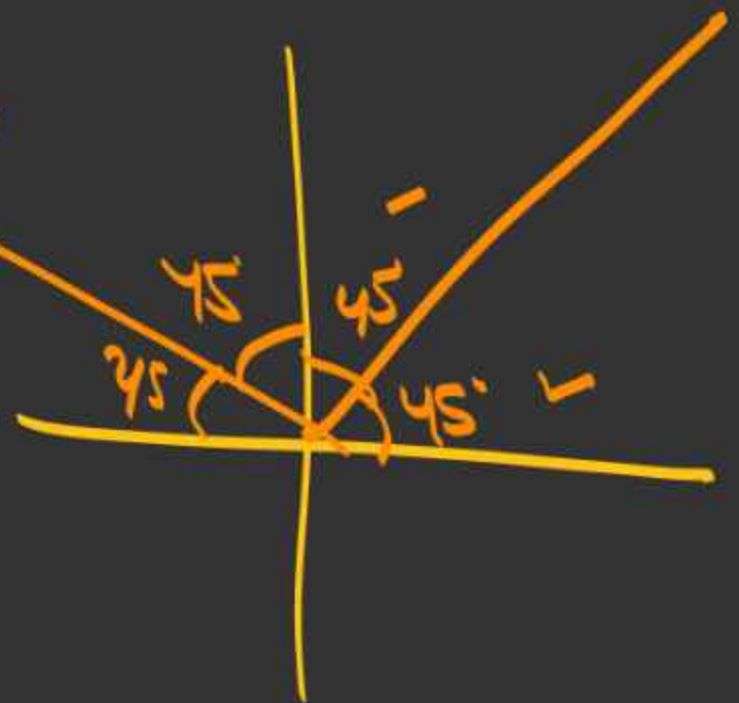


⑥ obtuse angle (आधिक्य कोण) ($90-180$)

$$m = \tan \theta \Rightarrow \left(\frac{dy}{dx} \right)_{(x_1, y_1)} < 0 \text{ -ve}$$

⑦ Equal Angle (x व y अक्ष के साथ समान कोण) $\rightarrow$

$$m = \tan \theta = \left(\frac{dy}{dx} \right)_{(x_1, y_1)} = \pm 1$$





Tangent $\parallel$ x-axis & Tangent $\perp$ y-axis

$$m = \tan \theta = \left(\frac{dy}{dx} \right)_{(x_1, y_1)} = 0$$

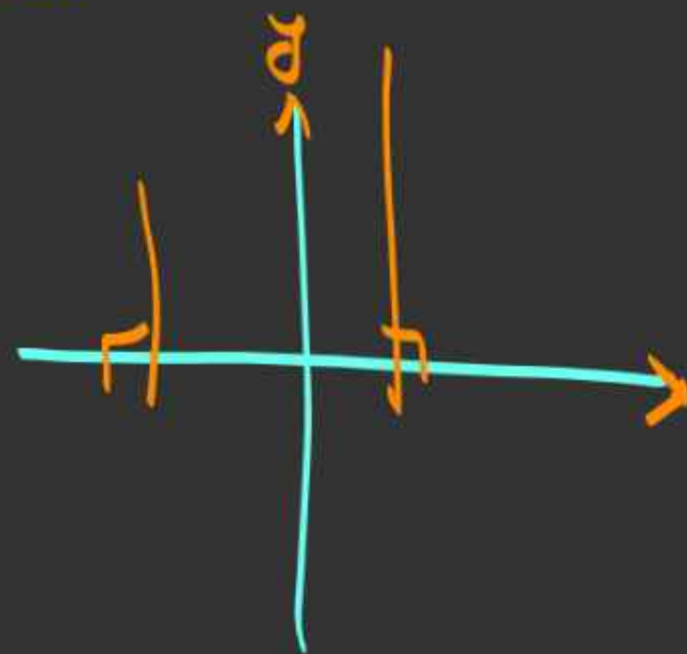
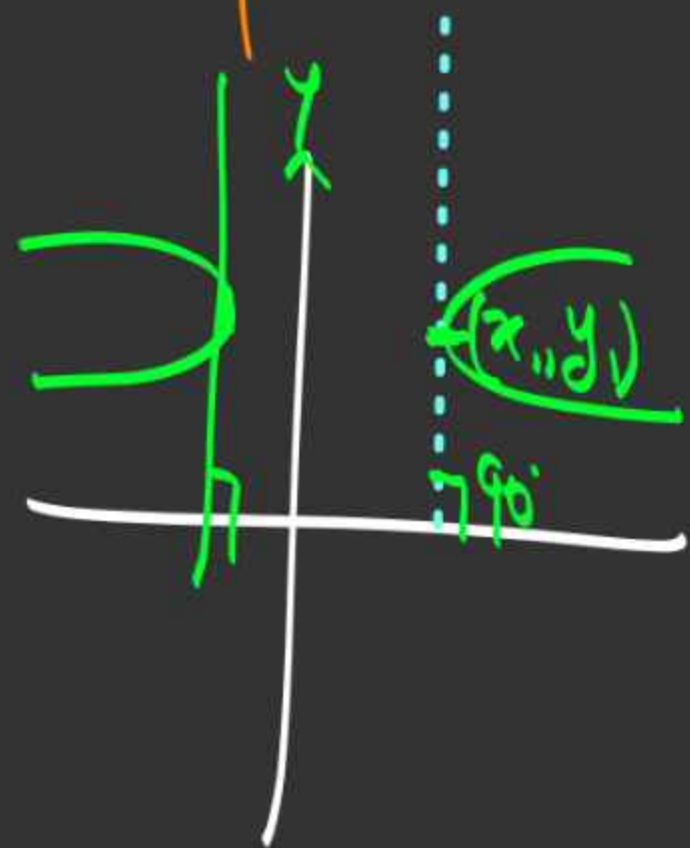


यदि स्पर्श रेखा y-अक्ष के समानांतर है तथा x-अक्ष पर लम्ब है।

(e) Tangent $\parallel$ y-axis & Tangent $\perp$ x-axis

$$m = \tan 90^\circ = \infty = \frac{1}{0}$$

$$\left(\frac{dy}{dx} \right)_{(x_1, y_1)} = \frac{1}{0} = \infty$$



Slope of Normal $\Rightarrow$
अभिन्तम्ब की प्रवणता

$$m = - \left(\frac{dx}{dy} \right)_{(x_1, y_1)}$$

$$\# y = x^3 - 3x^2 + 4x + 2$$

at $x=2$ पर स्पर्श रेखा
की प्रवणता?

$$\frac{dy}{dx} = 3x^2 - 6x + 4$$

at $x=2$

$$\frac{dy}{dx} \Rightarrow 3 \times 2^2 - 6 \times 2 + 4$$

Slope of tangent (m) = 4 Ans.

$$\text{Slope of Normal } (m_2) = -\frac{1}{4} \quad -\left(\frac{dx}{dy}\right)$$

$$\# y = 3x^2 - 4x + 4$$

वह पर बिन्दु खोजें अब
स्पर्श रेखा x-अक्ष के
समानान्तर है?

$$\frac{dy}{dx} = 6x - 4$$

x-अक्ष के
समानान्तर $\Rightarrow \frac{dy}{dx} = 0$

$$6x - 4 = 0$$

$$x = \frac{4}{6} \Rightarrow \frac{2}{3}$$

$$\text{बिन्दु} \Rightarrow \left(\frac{2}{3}, \frac{8}{3} \right)$$



$$y = 3 \times \left(\frac{2}{3} \right)^2 - 4 \left(\frac{2}{3} \right) + 4 \quad | \times 3$$

$$\Rightarrow \frac{4}{3} - \frac{8}{3} + \frac{12}{3}$$

$$y = \frac{8}{3}$$

Maxima & Minima