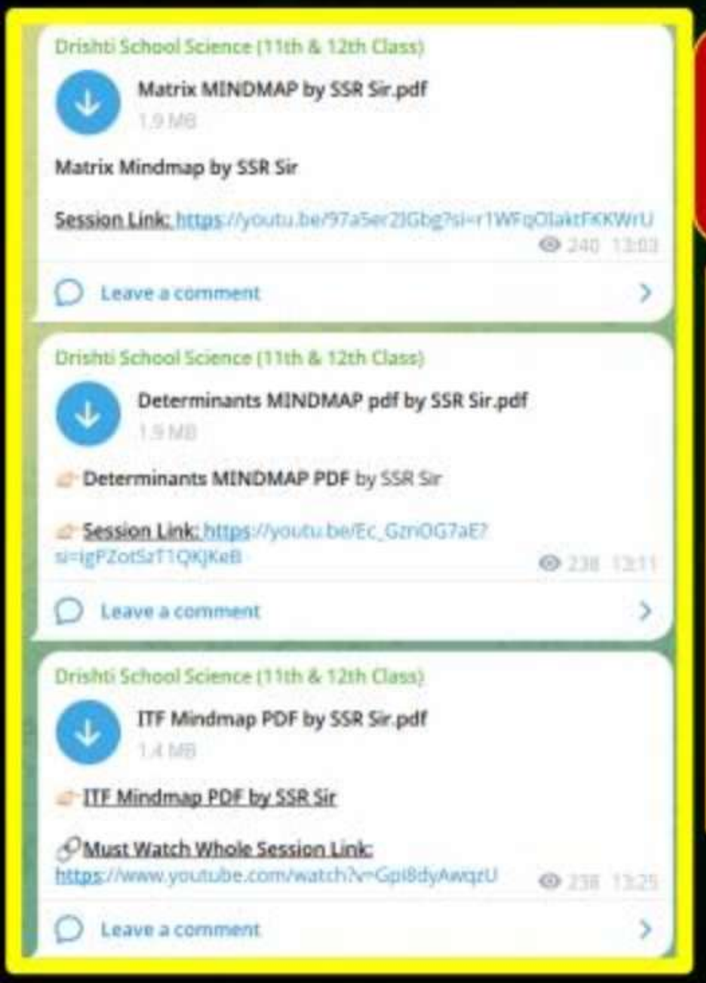
APPLICATION OF DERIVATIVES

ONE SHOT

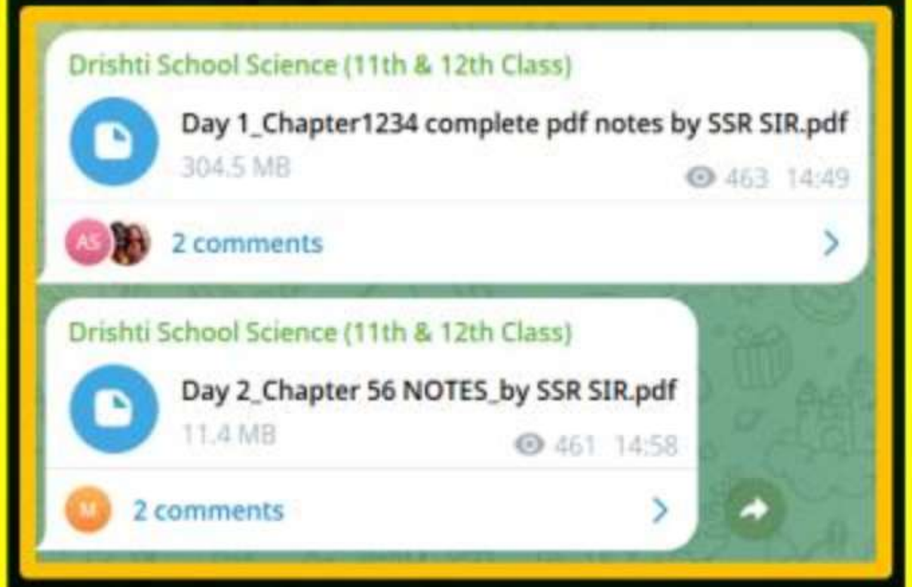
100% PAPER यहीं से बनेगा



For Class PDF, Guidence & Doubts Join Telegram Channel:



Telegram





Syllabus Covered

Chapter	Chapter Name	Syllabus	Deleted Syllabus
Chapter 6	Application of Derivatives	1. Monotonicity 2. Maxima and Minima 3. Rate of Change 4. Questions based on Maxima and Minima 5. Shortest Distances	→ Tangent and Normal → Rolles's theorem → LMVT Theorem → Approximation Method

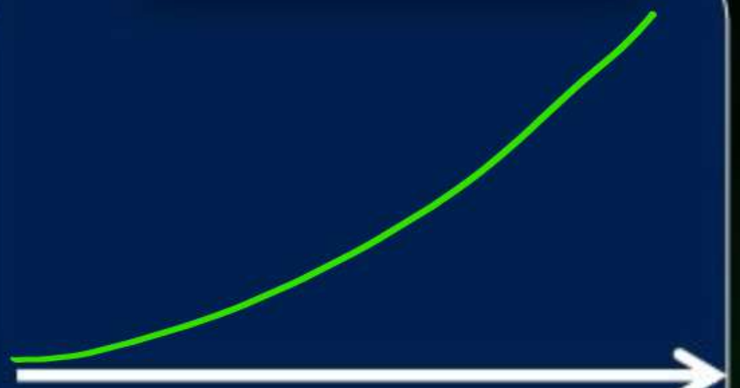


ABOUT CND

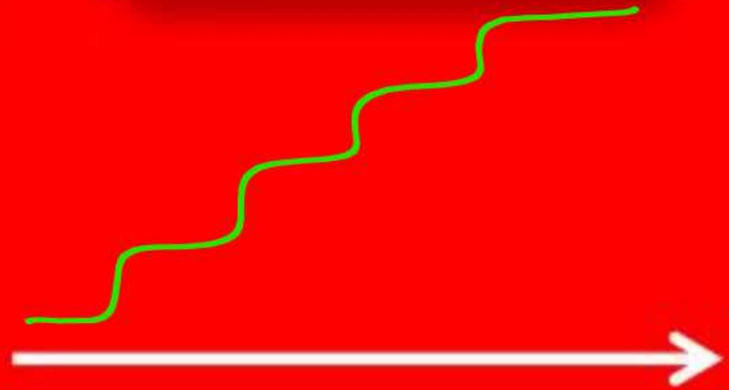
- Weightage in CUET: 15 -20 marks
- What resources you should follow:
- BPPT 5.0 only
- This PPT Content
- Importance of Chapter:
  - Conceptual Chapter hai, upper se pdhoge to nahi samjh aayega
  - Basics required like: inequality, WCM, Graphs etc.

By- SSR Sir

Strictly Increasing



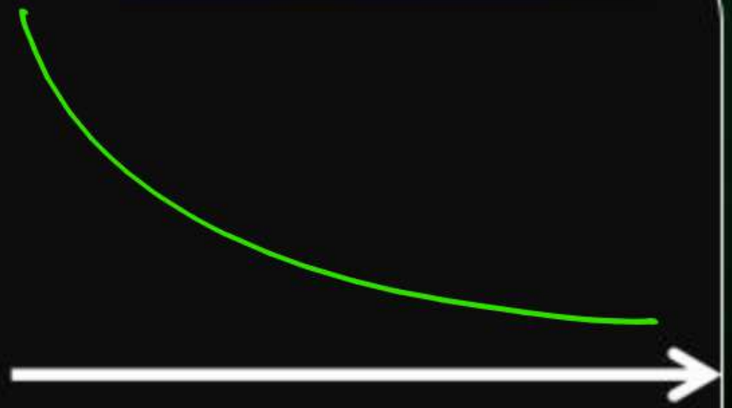
Increasing



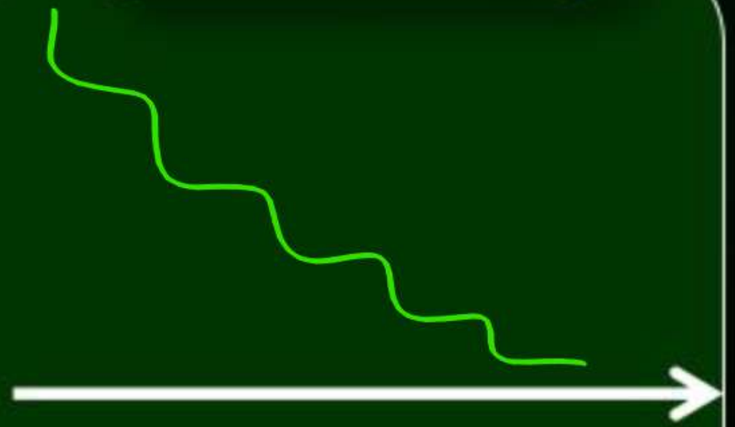
BASICS



Strictly decreasing

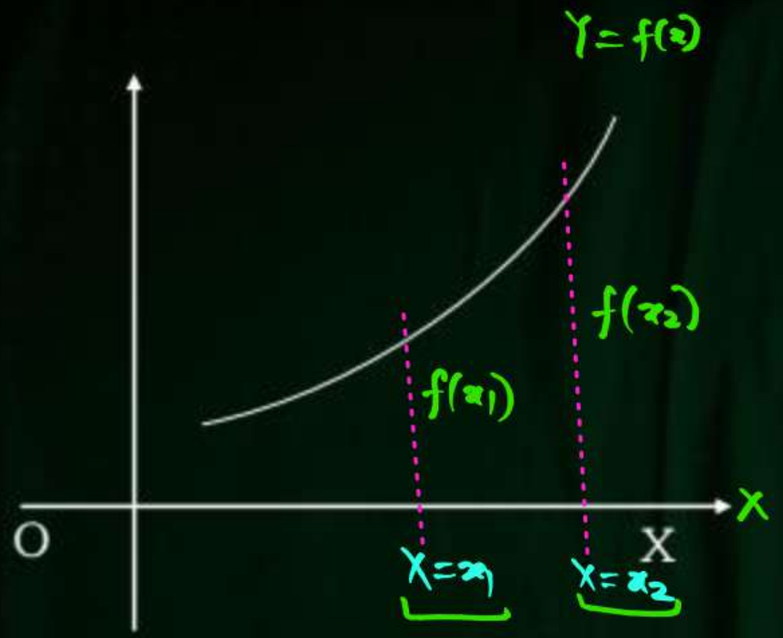


decreasing



Sir

Increasing Function at a Point



If $x_2 > x_1$

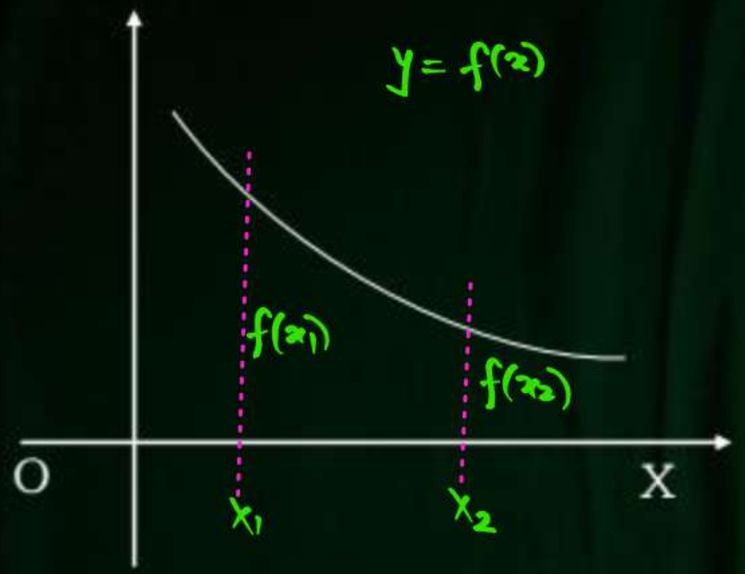
Then $f(x_2) > f(x_1)$

Then we say $f(x)$ is st ↑

➤ If $x_1 < x_2 \Rightarrow f(x_1) < f(x_2) \; \forall \; x_1, x_2 \in D$, then f(x) is called strictly increasing in domain D.



Decreasing Function at a Point

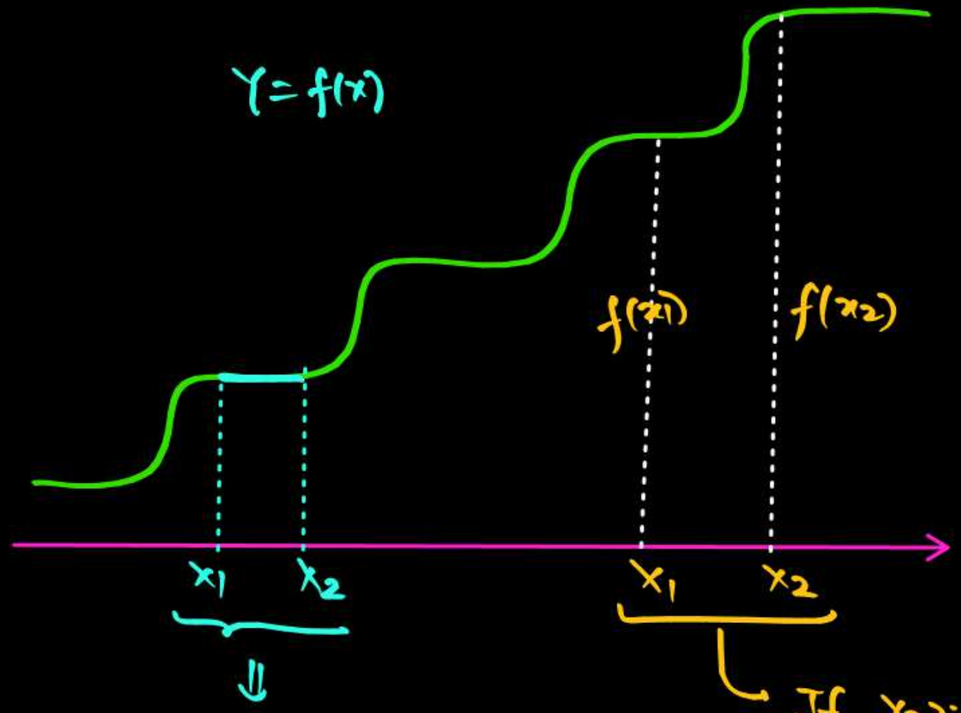


If $x_2 > x_1$

Then $\Rightarrow f(x_1) > f(x_2)$

↳ We say $f(x)$ is st ↓ fun.

➢ If $x_1 < x_2 \Rightarrow f(x_1) > f(x_2) \; \forall \; x_1, x_2 \in D$, then f(x) is called strictly Decreasing in domain D.



If $x_2 > x_1$

$\Rightarrow f(x_2) = f(x_1)$

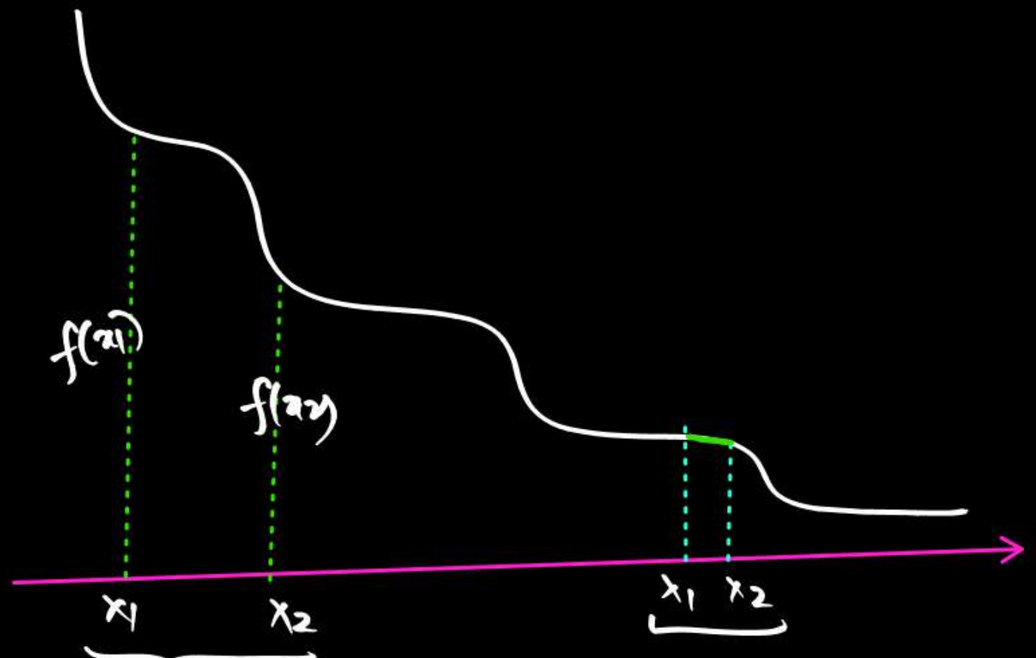
If $x_2 > x_1$

$\Rightarrow f(x_2) > f(x_1)$

If $x_2 > x_1$

$\Rightarrow f(x_2) \geq f(x_1)$

$\Rightarrow$ We say $f(x)$ is Increasing fm.



$\because x_2 > x_1$

$\therefore f(x_1) > f(x_2)$

$\because x_2 > x_1$

$\therefore f(x_1) = f(x_2)$

$\because x_2 > x_1$

$\Rightarrow f(x_2) \leq f(x_1)$ $\Rightarrow$ Then we say $f(x)$ is Decr fun



IMP – NOTE

1. $\forall x_1, x_2 \in [a, b], f(x_1) \geq f(x_2)$ if $x_1 > x_2 \Rightarrow$ Increasing Function
2. $\forall x_1, x_2 \in [a, b], f(x_1) > f(x_2)$ if $x_1 > x_2 \Rightarrow$ Strictly Increasing Function
3. $\forall x_1, x_2 \in [a, b], f(x_1) \leq f(x_2)$ if $x_1 > x_2 \Rightarrow$ Decreasing Function
4. $\forall x_1, x_2 \in [a, b], f(x_1) < f(x_2)$ if $x_1 > x_2 \Rightarrow$ Strictly Decreasing Function



QUESTIONS: CUET 2023 PYQs

Any function $f(x)$ is an increasing function in $[a, b]$ if :

(A) $\forall x_1, x_2 \in [a, b], f(x_1) \geqslant f(x_2)$ if $x_1 < x_2$

(B) $\forall x_1, x_2 \in [a, b], f(x_1) \geqslant f(x_2)$ if $x_1 > x_2$

(C) $\forall x_1, x_2 \in [a, b], f(x_1) \leq f(x_2)$ if $x_1 < x_2$

(D) $\forall x_1, x_2 \in [a, b], f(x_1) < f(x_2)$ if $x_1 > x_2$

Choose the correct answer from the options given below :

A (A), (D) Only

B (B), (D) Only

C (B), (C) Only

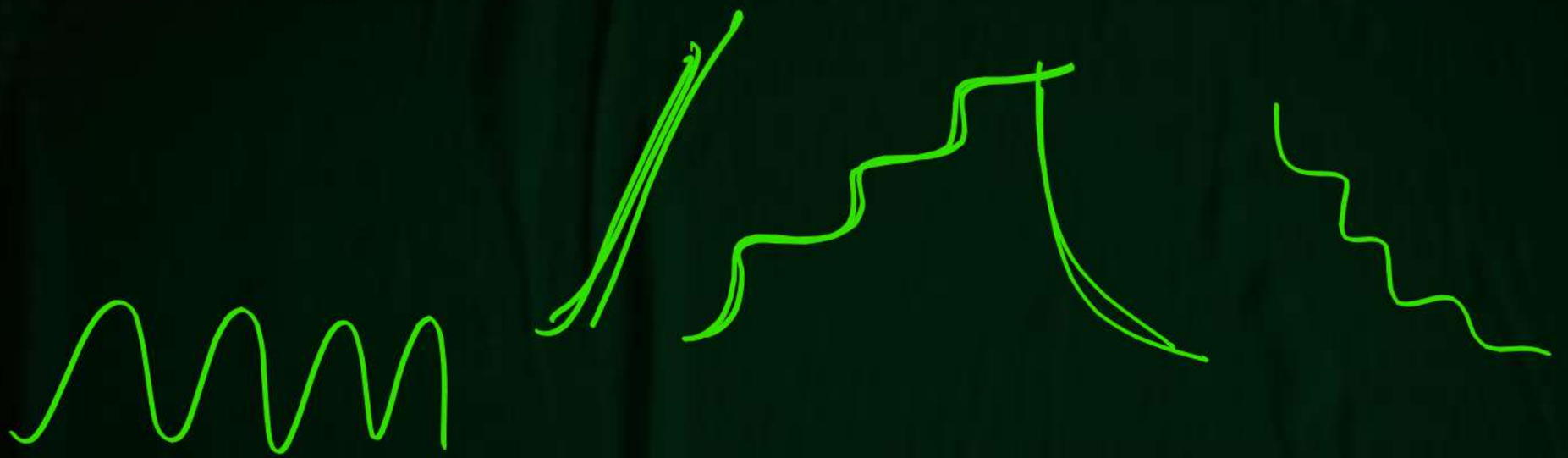
D (A), (C) Only

SSR SIR



MONOTONIC FUNCTION

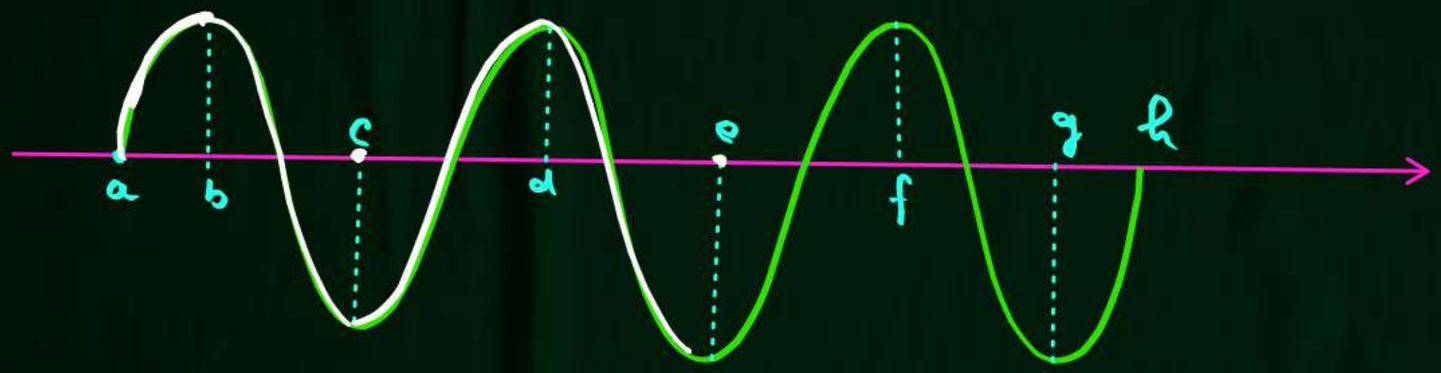
- A function which is increasing, strictly increasing, decreasing, strictly decreasing in (a, b), it is said to be Monotonic Function.





NON -MONOTONIC FUNCTION

➤ A function which is neither always increasing nor always decreasing.



$x \in [a,b] \cup [c,d] \cup [e,f] \cup [g,h] \rightarrow f(x) \uparrow$

$x \in [b,c] \cup [d,e] \cup [f,g] : f(x) \downarrow$

$x \in [a,h]$ = NEITHER $\uparrow$ nor $\downarrow$

$x \in [a,c] \Rightarrow$ " " "

$x \in [c,e] \Rightarrow$ " " "

Question: CUET 2026 PYQs

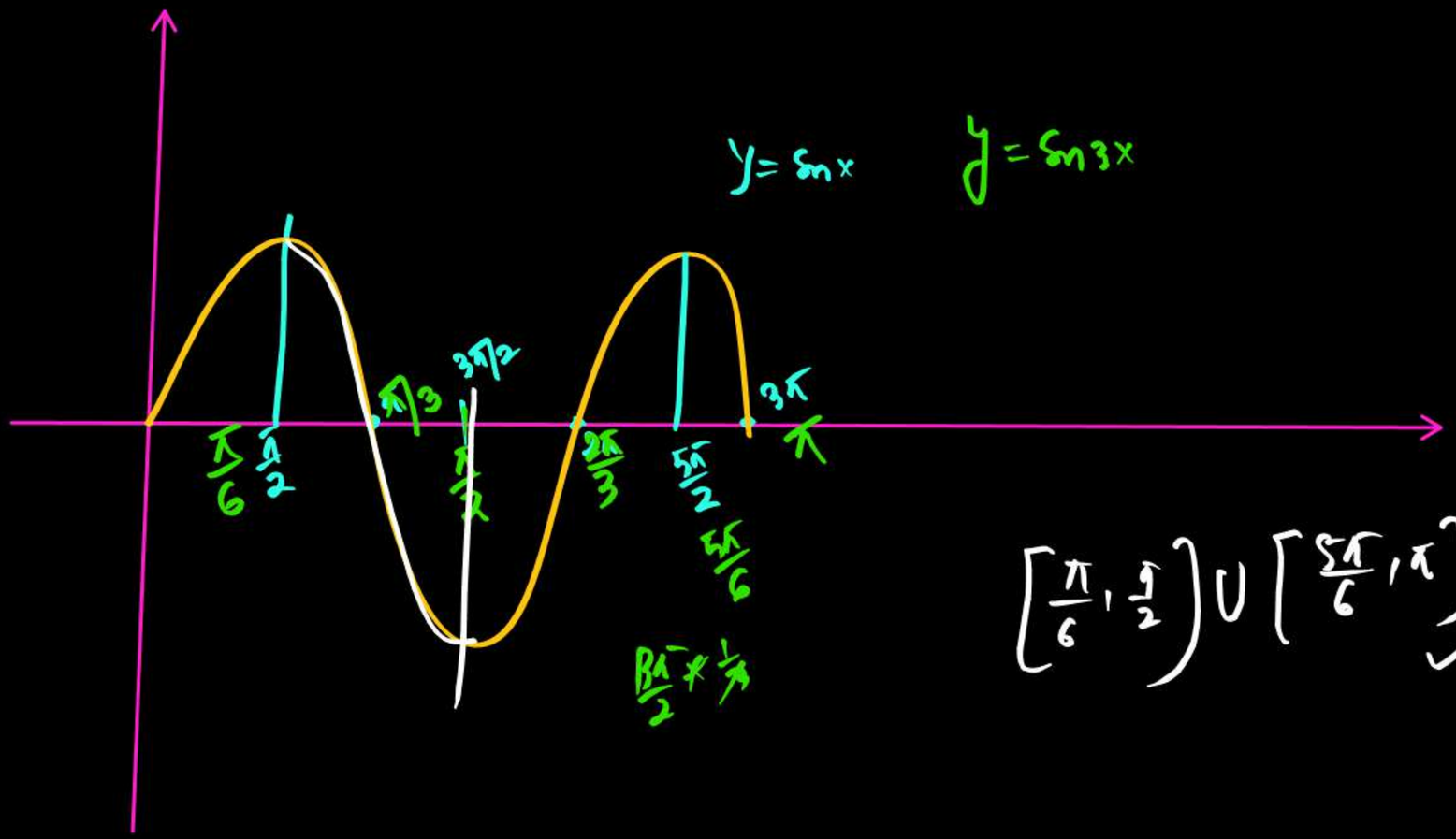
Function $f(x) = \sin 3x, x \in \left[0, \frac{\pi}{2}\right]$ **is decreasing in the interval**

A. $\left[0, \frac{\pi}{2}\right]$

B. $\left[0, \frac{\pi}{6}\right]$

C. $\left[\frac{\pi}{6}, \frac{\pi}{2}\right]$

D. $\left[0, \frac{\pi}{4}\right]$



$\left[\frac{\pi}{6}, \frac{\pi}{2}\right] \cup \left[\frac{5\pi}{6}, \pi\right]$

Question: CUET 2026 PYQs

If $f(x) = \cos 2x, 0 < x < \pi$, then $f(x)$ is

(A) Increasing on $(0, \pi/2)$

(B) Decreasing on $(\pi/2, \pi)$

(C) Increasing on $(\pi/2, \pi)$

(D) Decreasing on $(0, \pi/2)$

Choose the correct answer from the options given below:

A (A) and (B) only

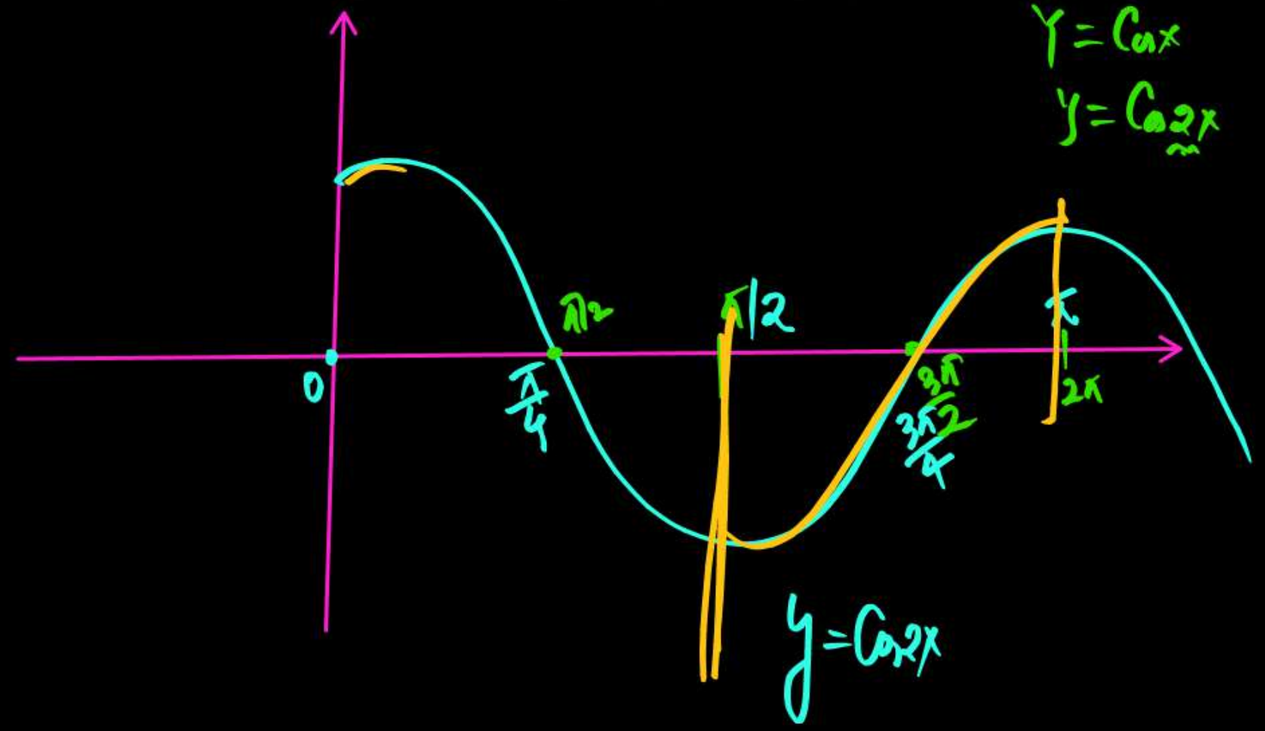
B (C) and (D) only

C (B) and (C) only

D (A) and (D) only

$y = f(x)$

$f(ax)$



Question: CUET 2026 PYQs

Which of the following functions are strictly decreasing on $\left(0, \frac{\pi}{2}\right)$?

A. $\cos\ x$

B. $-\cot\ x$

C. $\cos\ 2x$

D. $\sin\ x$

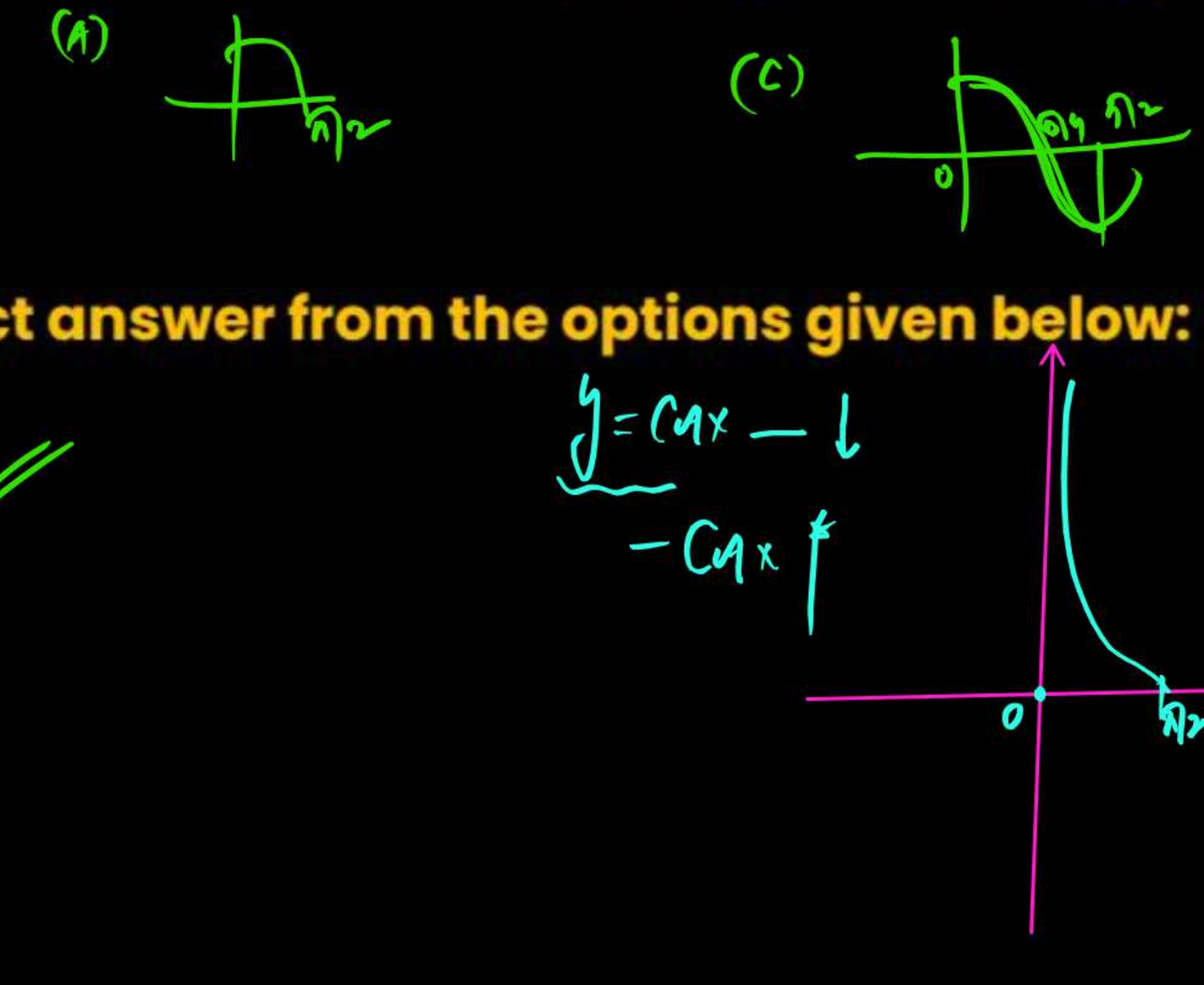
Choose the correct answer from the options given below:

A. A and C only

B. B and C only

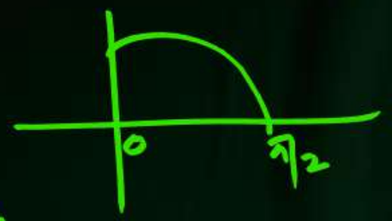
C. C and D only

D. A and D only



QUESTION: NCERT EXERCISE

Which of the following functions are decreasing on $(0, \frac{\pi}{2})$?



A Cos x ↓

B Cos 2x ↓



C Cos 3x ✗



D tan x ↑



Question – CUET 2025 PYQs

Which of the following functions are increasing on $x \in \left(0, \frac{\pi}{2}\right)$?

(A) $f(x) = sinx$ ↑

(B) $f(x) = cosx$ ↓

(C) $f(x) = tanx$ ↑

(D) $f(x) = cos3x$ ✗

(A)



Choose the correct answer from the options given below:

A (A) and (D) only

B (A) and (C) only

C (B) and (C) only

D (C) and (D) only

QUESTIONS: CUET 2023 PYQs

The function $f(x) = x^3$, is increasing for :

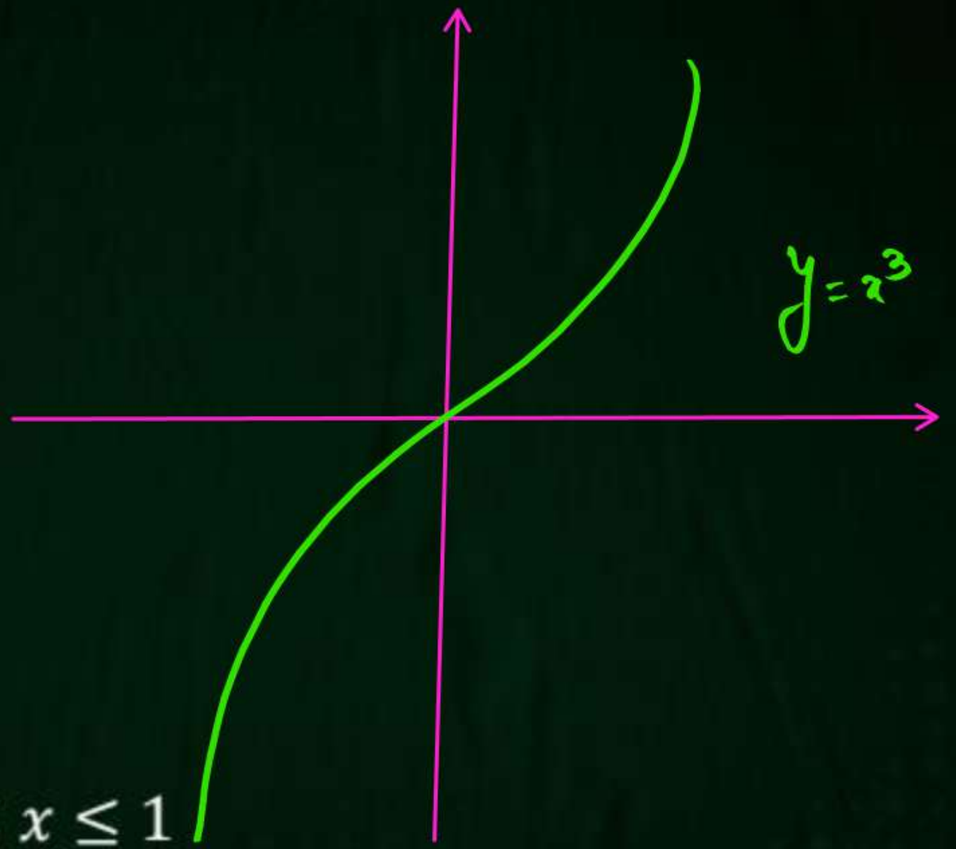
C

A Only positive values of x ✗

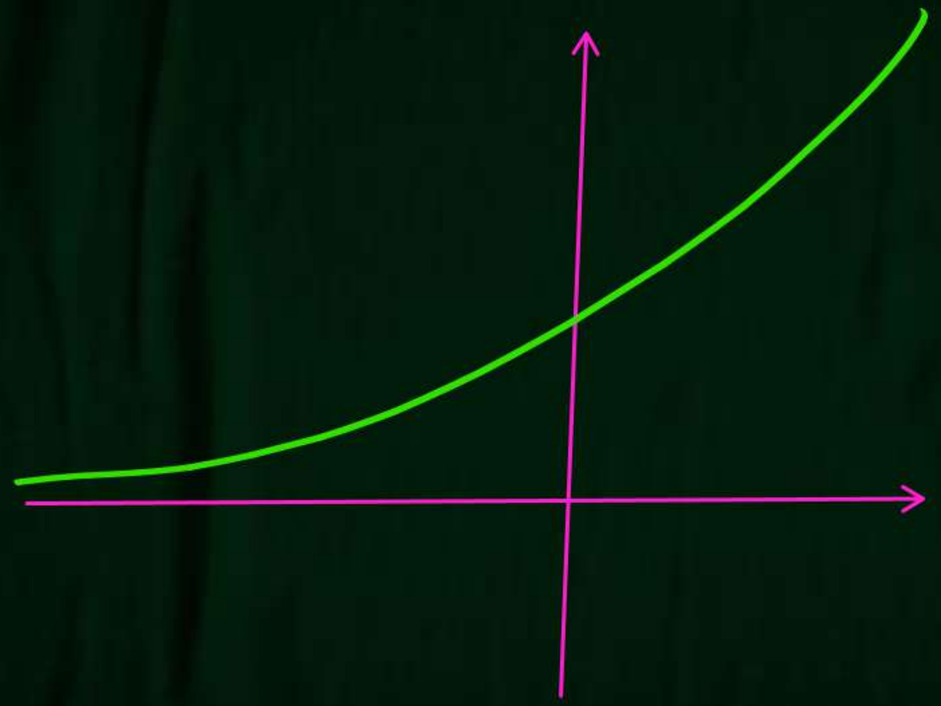
B Only negative values of x ✗

C For all real values of x

D For only the values of x, such that $-1 \leq x \leq 1$



Q. The interval in which the function f defined by $f(x) = e^x$ is strictly increasing, is



A $[1, \infty)$

B $(-\infty, 0)$

C $(-\infty, \infty)$

D $(0, \infty)$

QUESTIONS: CUET 2023 PYQs

The minimum value of $f(x) = |2x - 1|$ is

A $-\infty$

B 0

C $\frac{1}{2}$

D 1

QUESTIONS: CUET 2023 PYQs

The values of a for which, the function $f(x) = a^x$ is increasing on $\mathbf{R}$ are given by :

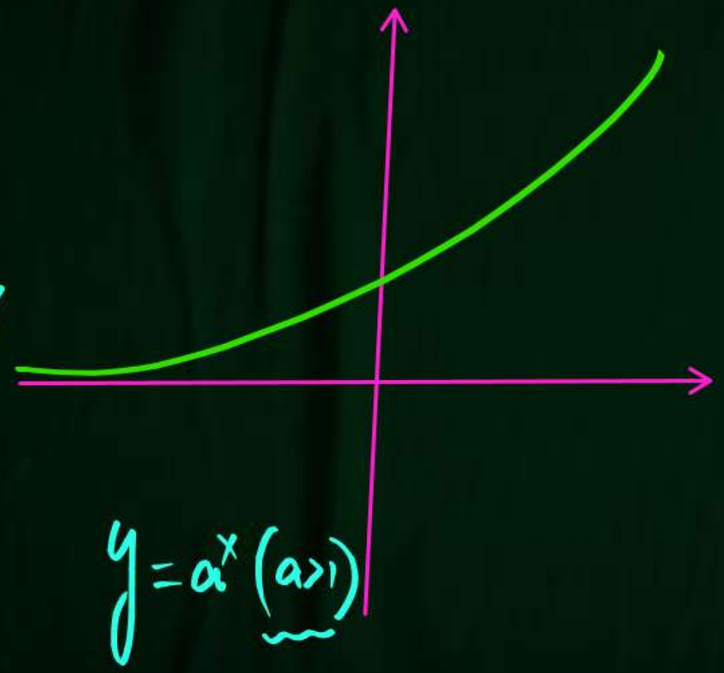
C

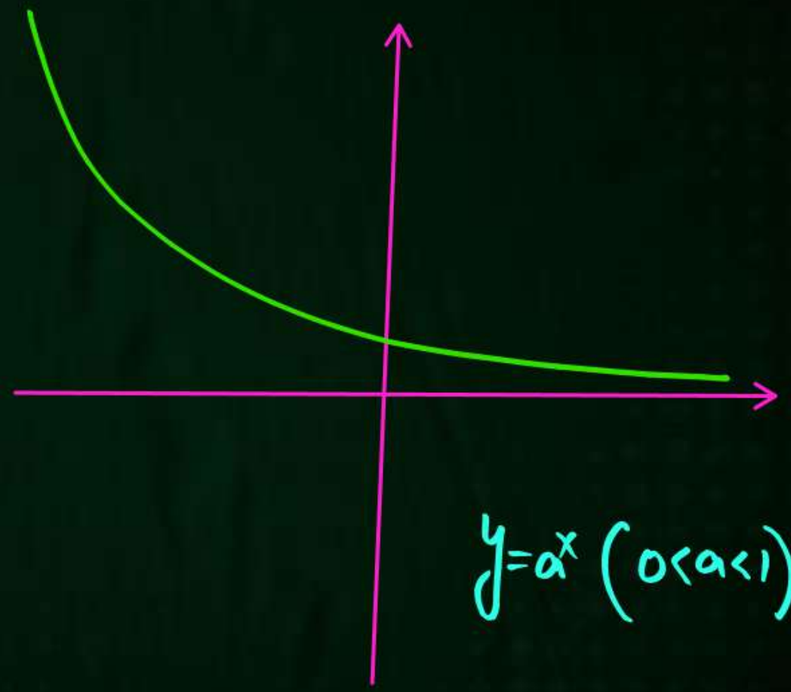
A $0 < a < x$ ✗

B $-\infty < a < \infty$ ✗

C $1 < a < \infty$

D $0 \leq a < \infty$





QUESTIONS: CUET 2023 PYQs

C

The local minimum value of the function $f(x) = |x| + 2$, where x is a real number is :

A 0

B -2

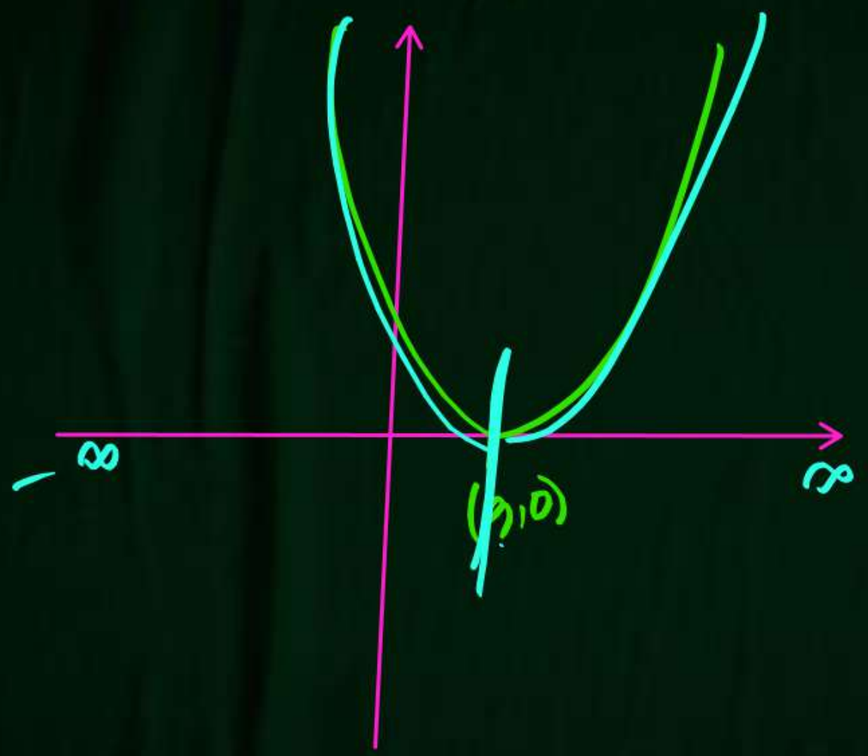
C 2

D 1

QUESTIONS: CUET 2023 PYQs

The function $y = (x-9)^2$ is strictly increasing in the interval(s):

$y = x^2 - (x-9)^2$



A $(-\infty, 3)$

B $(9, \infty)$

C $(-\infty, 3) \cup (9, \infty)$

D $(3,9)$

QUESTIONS: CUET 2023 PYQs

Which of the following functions is decreasing on $\left(0, \frac{\pi}{2}\right)$?

A $\sin 2x$

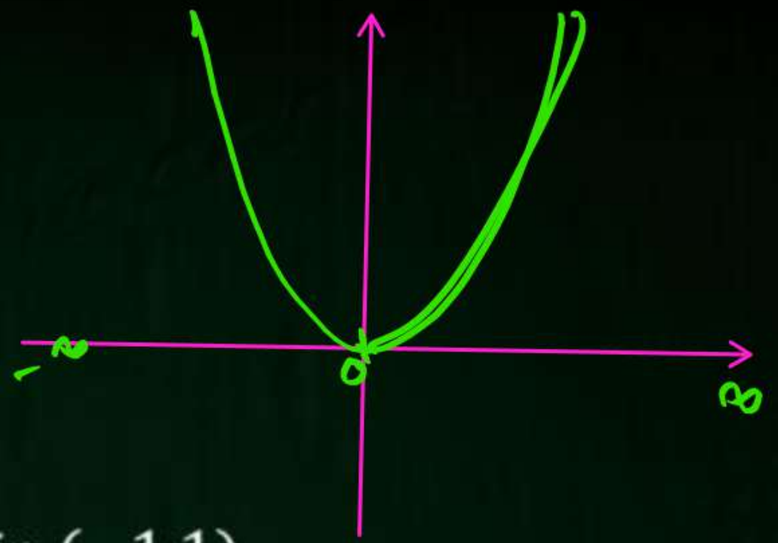
B $\tan x$

C $\cos x$

D $\cos 3x$

QUESTIONS: CUET 2023 PYQs

The function $f(x) = 3x^2$ is:



A increasing in $(-\infty, -1) \cup (1, \infty)$ and decreasing in $(-1,1)$

B decreasing in $(-\infty, -1) \cup (1, \infty)$ and increasing in $(-1,1)$

C increasing in $(0, \infty)$ and decreasing in $(-\infty, 0)$

D decreasing in $(0, \infty)$ and increasing in $(-\infty, 0)$

QUESTIONS: CUET 2023 PYQs

If m and M are respectively minimum and maximum values of $f(x) = |2 - |x||$, $-3 \leq x \leq 3$, then:

A $\mathrm{m} = 0$ and $\mathrm{M} = 2$

B $\mathrm{m} = 1$ and $\mathrm{M} = 2$

C $\mathrm{m} = 0$ and $\mathrm{M} = 4$

D $\mathrm{m} = 0$ and $\mathrm{M} = 1$

QUESTIONS: CUET 2023 PYQs

The function $f(x) = x^3 + 1$ is :

A increasing in $[2,3]$

B increasing at $x = 1$ only

C decreasing in $[2,3]$

D neither increasing nor decreasing

QUESTIONS: CUET 2023 PYQs

Which of the following function is increasing for all values of x in the domain $(0, \infty)$?

A $1 - x^2$

B $\frac{1}{x}$

C $8 - x^2$

D $x|x|$

QUESTIONS: CUET 2023 PYQs

Match List I with List II

LIST I		LIST II	
A.	$\sin 2x$	I.	decreases from 1 to 0 in $\left(0, \frac{\pi}{2}\right)$
B.	$\sin x$	II.	decreases if $x \in \left(0, \frac{\pi}{6}\right)$
C.	$\cos x$	III.	increases from 0 to 1 in $\left(0, \frac{\pi}{4}\right)$
D.	$\cos 3x$	IV.	is an increasing function in each quadrant

A. A-III, B-II, C-IV, D-I

B. A-III, B-IV, C-I, D-II

C. A-I, B-II, C-III, D-IV

D. A-IV, B-I, C-II, D-III

Choose the correct answer from the options given below :

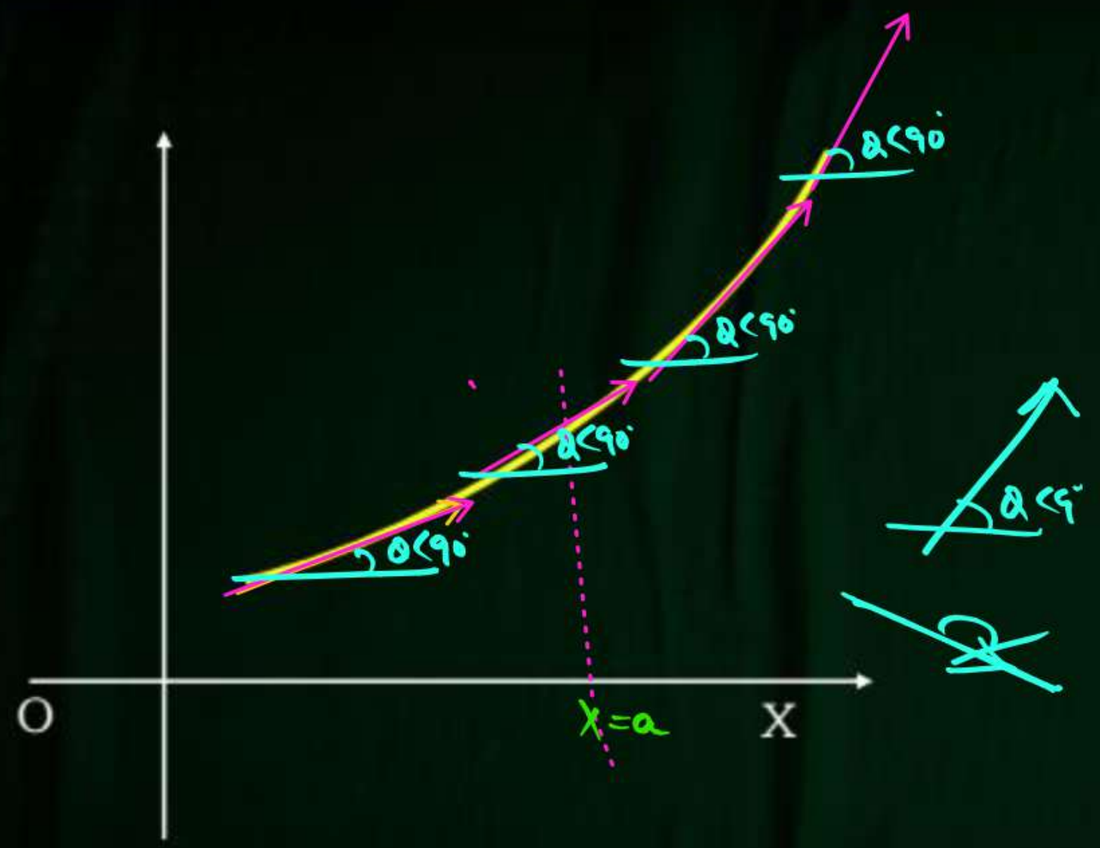
$\frac{dy}{dx}$ = Slope = tangent of θ

$\Rightarrow$ Rate of change of y ; w.r.t x

$\frac{dy}{dx} > 0 \Rightarrow$ R.O.C > 0

$\frac{dy}{dx} < 0 \Rightarrow$ R.O.C < 0

1st Order Derivative Testing of Increasing Function



$\therefore \theta < 90^\circ \Rightarrow \tan\theta > 0 \Rightarrow$ Slope > 0



$\Downarrow$

$\frac{dy}{dx} > 0$

$\Downarrow$

$f'(x) > 0$

Sign of f'(x)

$f'(a) \neq 0$

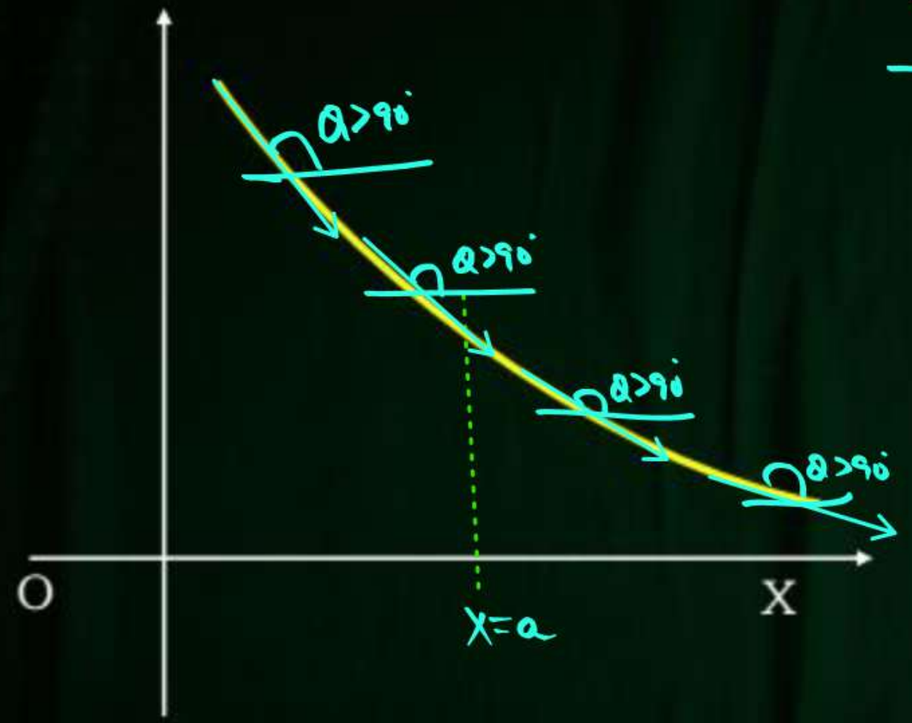
+ + + + + + | + + + + + + +

$x=a$

$f(x)$ ↑

1st Order Derivative Testing of Decreasing Function





$\because \theta > 90^\circ \Rightarrow \tan\theta < 0 \Rightarrow$ Slope < 0



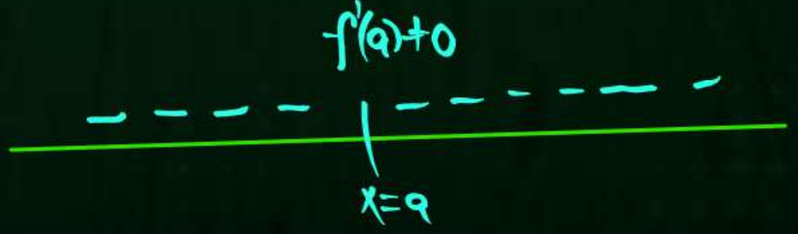
$\Downarrow$

$\frac{dy}{dx} < 0$

$\Downarrow$

$f'(x) < 0$

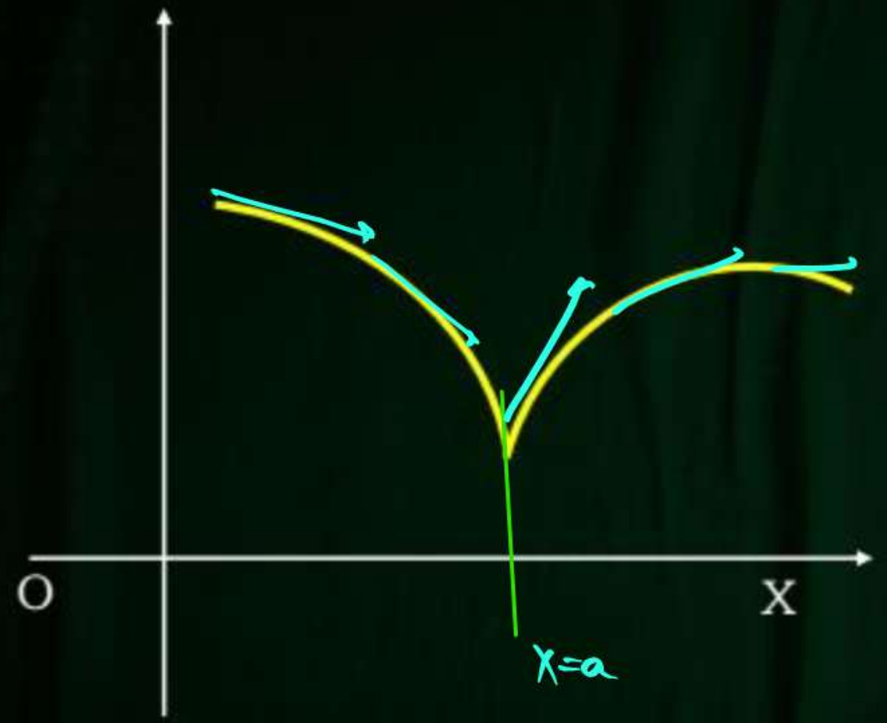
Sign of f'(x)



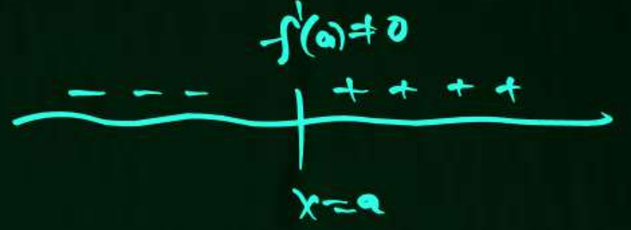
$f(x)$ is N $\downarrow$ at $x=a$.



Neither Increasing Nor Decreasing Function



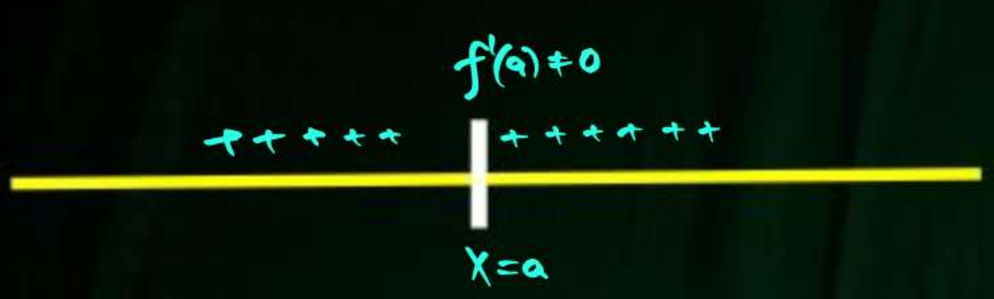
Sign of f'(x)



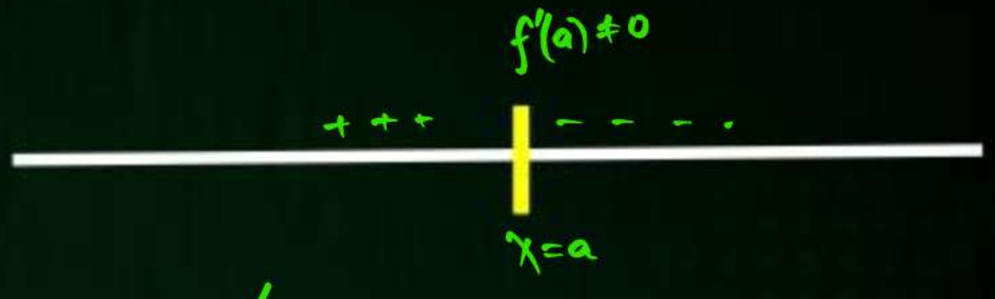
Neither ↑ nor ↓



IMP. NOTE: Sign of f'(x)



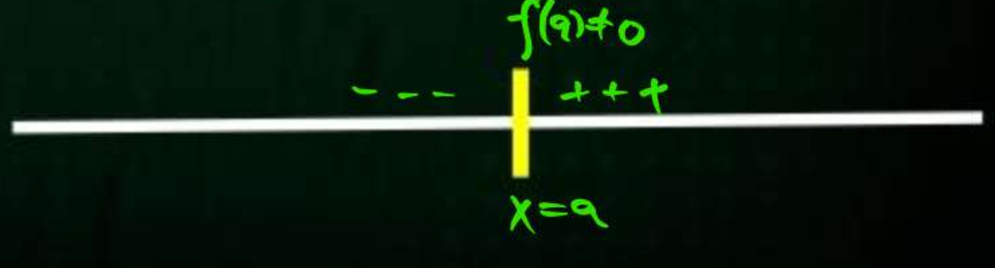
f(x) is st ↑ at x = a



Neither ↑ nor ↓ fun



f(x) is ↓ at x = a.



Increasing & Decreasing Function in an interval

Let we have a function $y = f(x)$ is defined in the defined domain

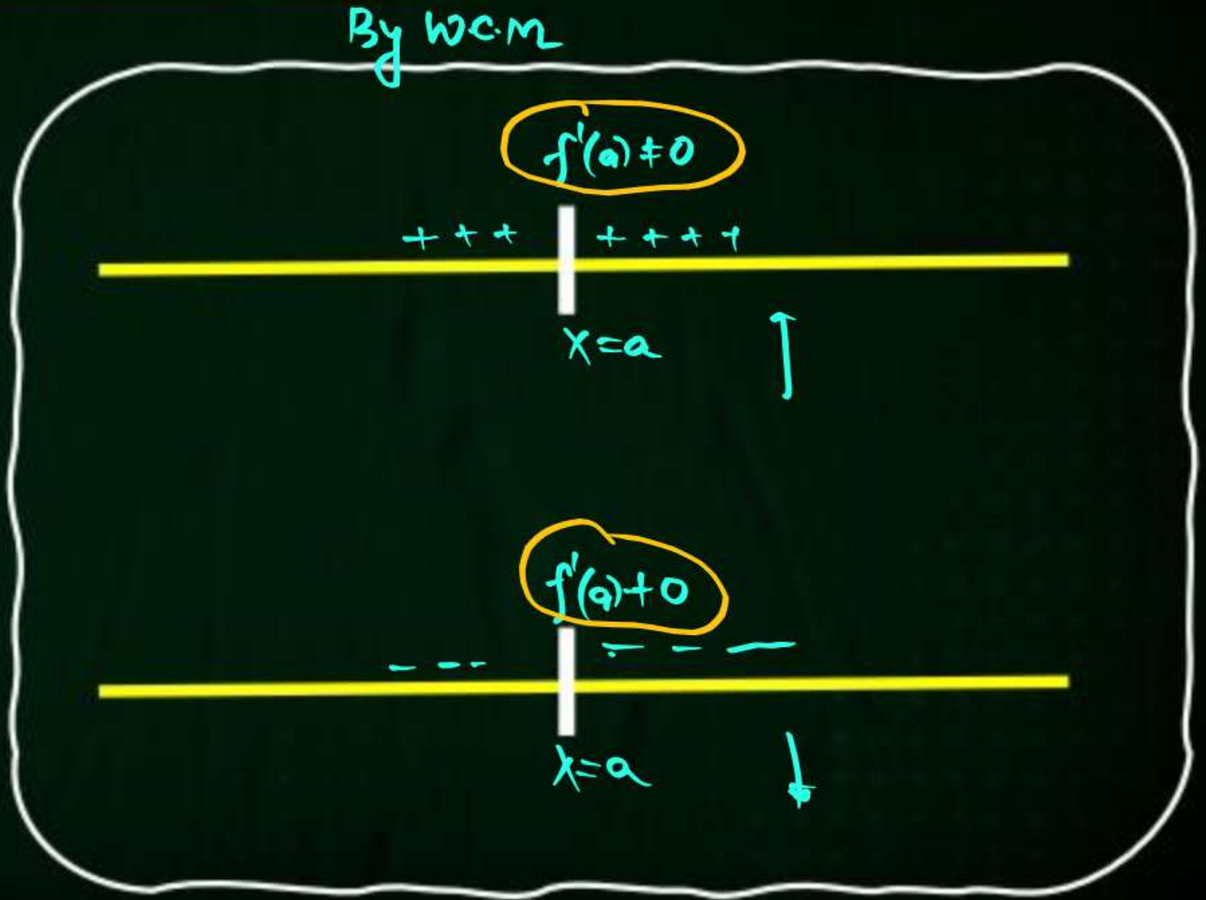
Step1: Find f'(x) $\frac{dy}{dx} = ?$

Step 2: Find Critical Point(CP)

$f'(x) = 0$ $\frac{dy}{dx} = 0$

Step 3: Use 1st order derivative testing.

By WCM



W.C.M.

$$f(x) = \sqrt{x^2 - 5x + 6}$$

$f(x) \geq 0$

$\hookrightarrow x \in$

(I) $x^2 - 5x + 6$

$\Rightarrow (x-2)(x-3)$

(II)



$\Rightarrow \quad x \in (-\infty, 2] \cup [3, \infty)$

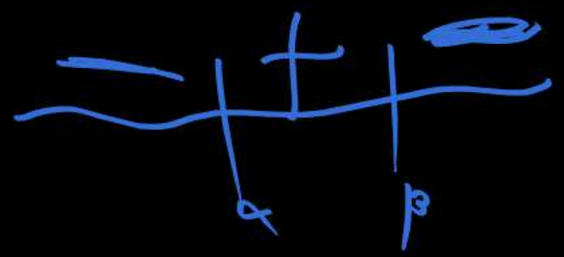
$\leq \quad \underline{x \in [2,3]}$

(III) $$f(x) = \frac{(x-y)^1 (x-3)^4}{(x-5)^5 (x-8)^3}$$

$\Rightarrow$ EVEN POWER $\Rightarrow$ Sign Don't change
ODD POWER $\Rightarrow$ Sign change]



(IV) $f(x) = -x^2 - 5x + 6$



Question: CUET 2026 PYQs

The function $f(x) = -2x^3 - 9x^2 - 12x + 5$ is decreasing in the interval(/s):

A $(-\infty, -2) \cup (-2, -1)$

B $(-2, -1)$

C $(-\infty, -2) \cup (-1, \infty)$

D $(-\infty, \infty)$

(I) $f'(x) = -6x^2 - 18x - 12$

$\Rightarrow -6[x^2 + 3x + 2]$

$\Rightarrow -6[x^2 + 2x + x + 2]$

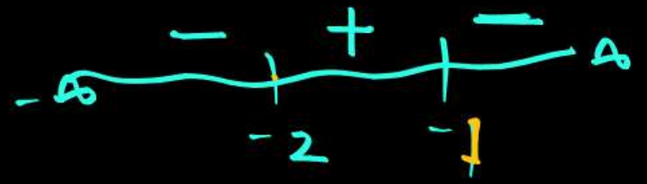
$\Rightarrow -6(x+2)(x+1)$

(II) $f'(x) = 0$

$x = -2$

$x = -1$

(III) WCM



$\therefore x \in (-\infty, -2) \cup (-1, \infty)$

St 1

(I) $f'(x)$

(II) $f'(x) = 0$

(III) find C.P.

(IV) Use W.C.M



(V) Jab Interval kiko C.P par Hamesh open Bracket lagao.

Incr

$x \in (-2, -1)$

Or $x \in (-2, -1)$

Question: CUET 2026 PYQs

Function $f(x) = \frac{3}{2}x^4 - 4x^3 - 45x^2 + 25$ **is:**

(A) increasing in $(-\infty, -3)$

(B) Decreasing in $(-3, 0)$

(C) increasing in $(-3, 0)$

(D) Decreasing in $(0, 5)$

Choose the correct answer from the options given below:

A (A), (B) and (C) only

B (B), (C) and (D) only

C (C) and (D) only

D (A) and (D) only

(I) $f'(x) = \frac{3}{2}[4x^3] - 12x^2 - 90x$

$\Rightarrow 6x^3 - 12x^2 - 90x$

$\Rightarrow 6x[x^2 - 2x - 15]$

$\Rightarrow 6x[x^2 - 5x + 3x - 15]$

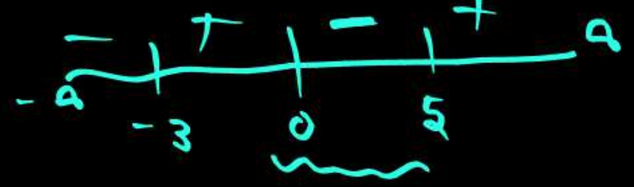
$\Rightarrow 6x[x-5][x+3]$

(II) for CP

$f'(x) = 0$

$x = 0, \; x = 5, \; x = -3$

(III) W.I.M



Question: CUET 2026 PYQs

The interval for which $f(x) = \frac{x^2}{2} + \frac{8}{x^2}$, $x \neq 0$ is increasing, is:

(A) $(-\infty, -2)$

(B) $(-\infty, -2) \cup (2, \infty)$

(C) $(-2, 2)$

(D) $(-2, 0) \cup (2, \infty)$

(I) $f'(x) = \frac{2x}{2} + 8\left(\frac{-2}{x^3}\right)$

$f'(x) = \frac{(x^4 - 16)}{x^3}$

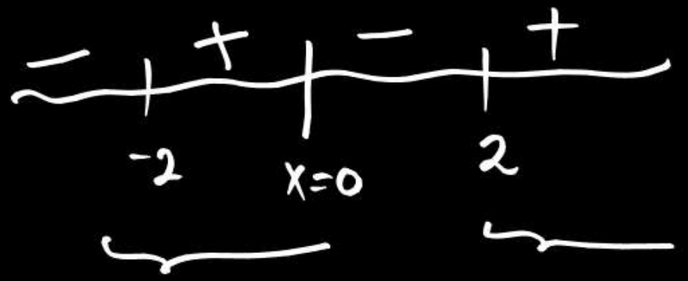
(II) $f'(x) = 0$

$x^4 = 16$

$x^2 = 4$

$x = \pm 2$

(III) LCM



$x \in (-2, 0) \cup (2, \infty)$

Question: CUET 2026 PYQs

The function $f(x) = 2x^3 - 3x^2 - 36x + 7$ **is:**

A. Increasing in $(-\infty, -2)$

B. Decreasing in $(-2, 3)$

C. Neither increasing nor decreasing in $(-2, 3)$

D. Increasing in $(3, \infty)$

Choose the correct answer from the options given below:

(A) A and B only

(B) B, C and D only

(C) A, B and D only

(D) C and D only

$f'(x) = 6x^2 - 6x - 36$

$\Rightarrow 6[x^2 - x - 6]$

$\Rightarrow 6[x^2 - 3x + 2x - 6]$

$\Rightarrow 6(x-3)(x+2)$

(i) $f'(x) = 0$

$x = 3, -2$

(iii) LHCM



A ✓

B ✓

C ✗

D ✓

Question: CUET 2026 PYQs

The function $f(x) = 24x^4 - 32x^3 - 96x^2 + 7$ on the interval $\left[-\frac{3}{2}, 4\right]$ is:

A. increasing in $(-1, 0)$

B. decreasing in $(0, 4)$ ✗

C. increasing in $(2, 4)$

D. decreasing in $\left(-\frac{3}{2}, -1\right)$

$f'(x) = 96x^3 - 96x^2 - 96*2x$

$\Rightarrow 96x\left[x^2 - x - 2\right]$

$\Rightarrow 96x\left[x^2 - 2x + x - 2\right]$

$x \in [-1.5, 4]$

$f'(x) \Rightarrow 96x(x-2)(x+1)$

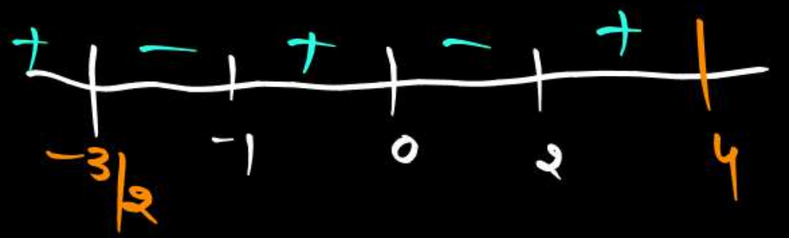
(III) WCM

FOR CP $f'(x) = 0$

$x = 0$

$x = 2$

$x = -1$



Choose the correct answer from the options given below:

(A) A, B and C only

(B) A and C only

(C) B and C only

(D) A, C and D only

Question: CUET 2026 PYQs

If $f(x) = (x+3)e^{-x}$, then which of the following statements are True?

(A) Function f(x) is increasing on $(-2, \infty)$.

(B) Function f(x) is decreasing on $(-2, \infty)$.

(C) Function f(x) is increasing on $(-\infty, -2)$.

(D) Function f(x) is decreasing on $(2, 3)$.

(A) (A) and (D) only

(B) (B) and (C) only

(C) (B), (C) and (D) only

(D) (A) and (B) only

(I) $f'(x) = 1(e^{-x}) + (x+3)[-e^{-x}]$

$f'(x) \Rightarrow e^{-x}[1-(x+3)]$

$f'(x) = e^{-x}[-2-x]$

$e^{-x} > 0$

$[e^{-x} \neq 0]$

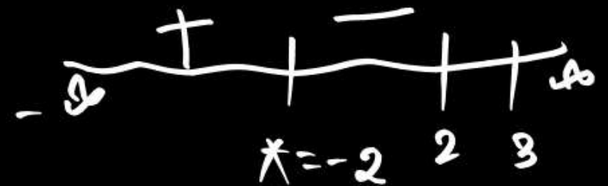
(II) CP

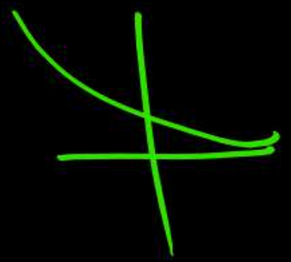
$f'(x) = 0$

$-2-x = 0$

$x = -2$

(II) local





Question: CUET 2026 PYQs

The function $f(x) = -x^3 + 12x^2 - 36x + 21$ is:

A. Increasing on $(-\infty, 2)$

B. Decreasing on $(-\infty, 2)$

C. Increasing on $(2, 6)$

D. Decreasing on $(6, \infty)$

$f'(x) = -3x^2 + 24x - 36$

$f'(x) \Rightarrow -3[x^2 - 8x + 12]$

Choose the correct answer from the options given below:

(A) A and D only

(B) A, B and D only

(C) A, B and C only

(D) B, C and D only

(I) $f'(x) = -3[x^2 - 6x - 2x + 12]$

$\Rightarrow -3[x-6][x-2]$

(II) $f'(x) = 0$

$x = 6, 2$

(III)



Question: CUET 2026 PYQs

The function $f(x) = \cot^{-1} x + x$ increases in the interval:

A. $(1, \infty)$

B. $(-\infty, 0)$

C. $(-\infty, \infty)$ ✓

D. $(0, \infty)$

$$f'(x) = \frac{-1}{(1+x^2)} + 1$$

$$= \frac{-1 + 1 + x^2}{(1+x^2)}$$

$$f'(x) = \frac{x^2}{(1+x^2)} \geq 0$$

$(1+x^2) > 0$

$x \in R$

Question: CUET 2026 PYQs

The function $f(x) = 17 - 9x + 6x^2 - x^3$ is strictly increasing in the interval, is:

$f'(x) = -9 + 12x - 3x^2$

$\Rightarrow -3[x^2 - 4x + 3]$

$\Rightarrow -3[x^2 - 3x - x + 3]$

$\Rightarrow -3[x-3][x-1]$

(A) $\forall x \in R$

(B) $x \in (-\infty, -1] \cup [3, \infty)$

(C) $x \in (-\infty, 1] \cup [3, \infty)$

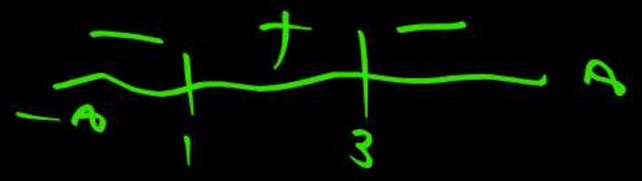
(D) $x \in [1, \infty)$

(II) $f'(x) = 0$

$x = 3$

$x = 1$

(III) WCM



for ↑ $x \in (1,3)$

Ans

Comment.

Question: CUET 2026 PYQs

For the function $f(x) = (x-1)^3 (x-2)^2$
Match the LIST-I with LIST-II

List-I	List-II
A. $f(x) \geq 0$	I. $x \in (-\infty, 1) \cup \left(1, \frac{8}{5}\right) \cup (2, \infty)$
B. $f(x) < 0$	II. $x \geq 1$
C. $f(x)$ is increasing if	III. $x < 1$
D. $f(x)$ is decreasing if	IV. $x \in \left(\frac{8}{5}, 2\right)$

$f'(x) = 3(x-1)^2(x-2)^2 + (x-1)^3 \cdot 2(x-2)$

$\Rightarrow (x-1)^2(x-2)[(x-2)\cdot 3 + (x-1)\cdot 2]$

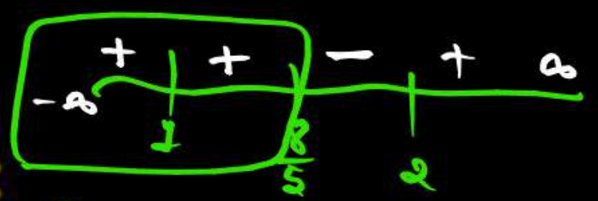
$\Rightarrow (x-1)^2(x-2)[3x-6+2x-2]$

$f'(x) \Rightarrow (x-1)^2(x-2)^1[5x-8]^1$

(II) $f'(x) = 0$

$x = 1, \quad x = 2, \quad x = 8/5$

(III)



$\therefore x \in (-\infty, 1) \cup (1, 8/5) \cup (2, \infty)$

↓ $(8/5, 2)$

Choose the correct answer from the options given below:

(A) A – I, B – IV, C – II, D – III

(B) A – II, B – III, C – I, D – IV

(C) A – II, B – III, C – IV, D – I

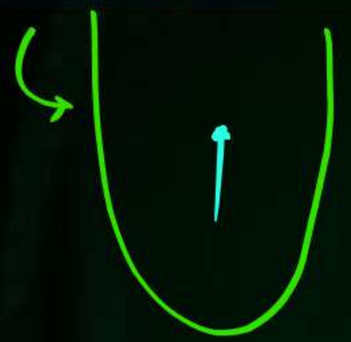
(D) A – I, B – IV, C – III, D – II



POINT OF Inflection

- Point of inflection is a point, where function changes its concavity

Concave Upward

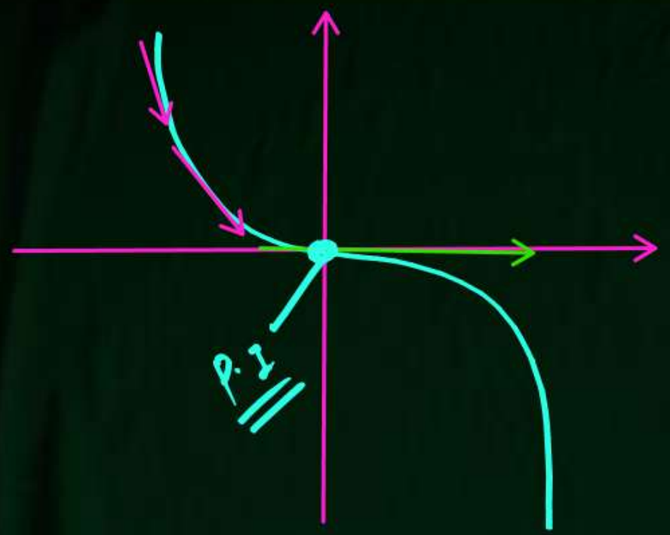


$\frac{d^2y}{dx^2} > 0$

Concave Downward



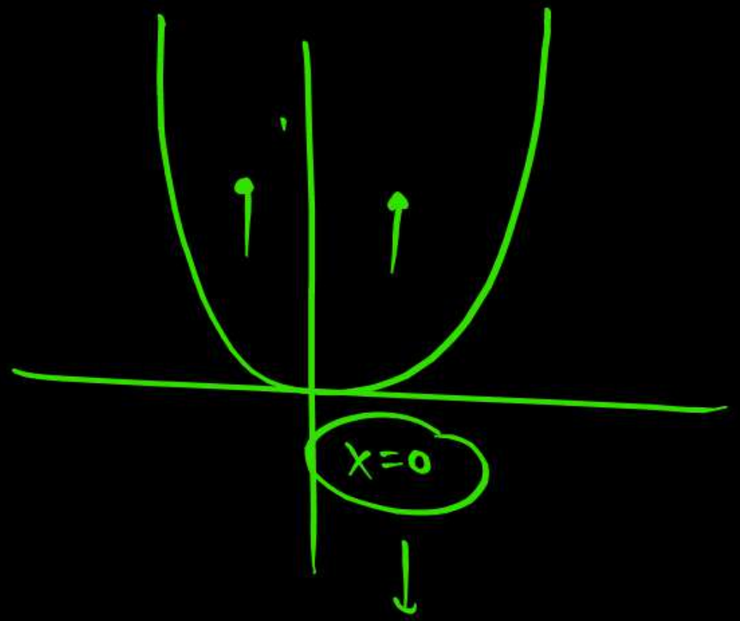
$\frac{d^2y}{dx^2} < 0$







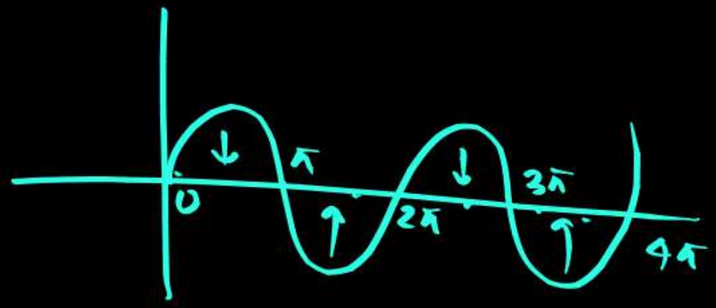
* $y = x^2$



↓

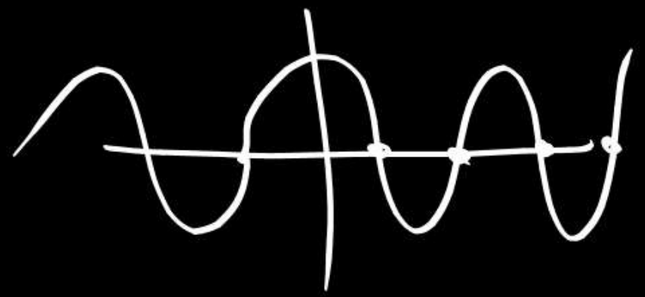
X>0 P.O.J

Eg. $y = \sin x$



$x \in n\pi \quad n \in \mathbb{Z}$

Eg. $y = \cos x$





How to find Point of Inflection

- **1st order derivative testing** $y=f(x)$

↑↓

(I) $f'(x)$

(II) $f'(x)=0$

(III) CP

(IV) WCM

Sign of $f'(x)$

$f'(a)=0$

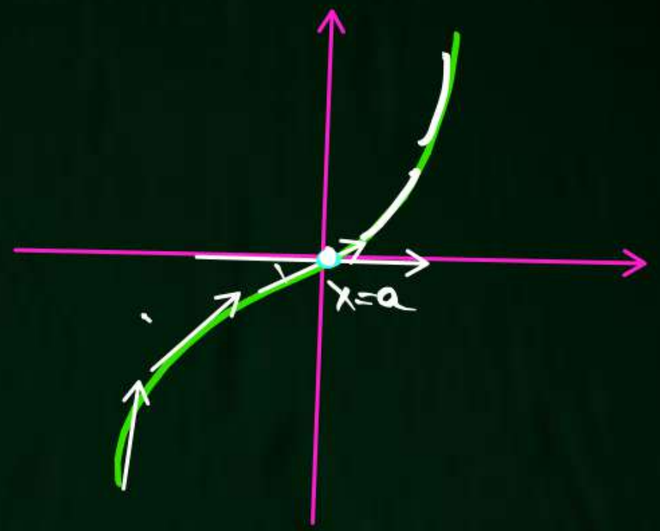
+ + + + | + + + + + +

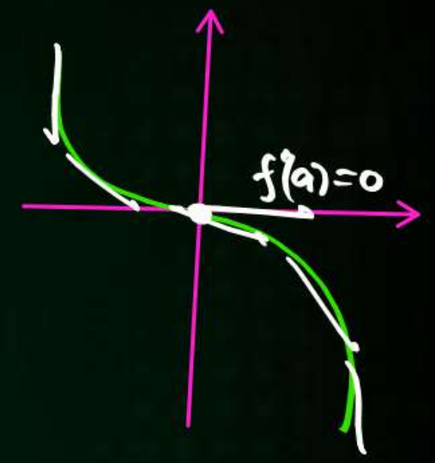
$x=a$

$f'(a)=0$

− − − − | − − − − −

$x=a$







How to find Point of Inflection

- **2nd order derivative testing**

$Y = f(x)$

(I) find $\frac{dy}{dx}$

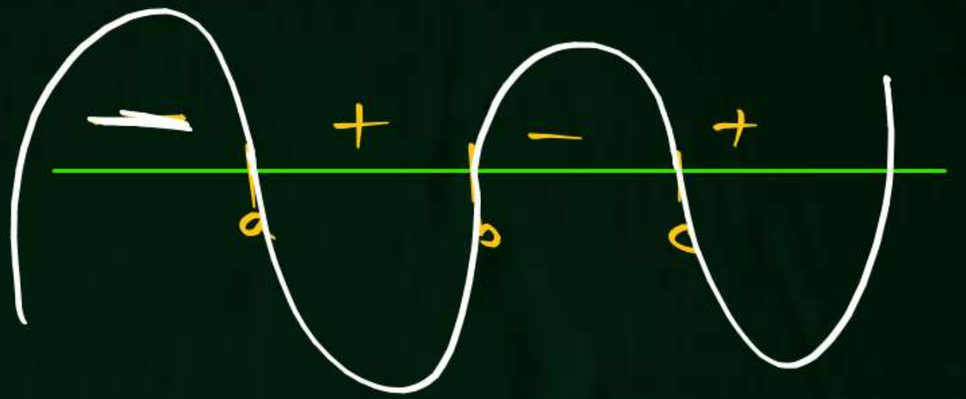
(II) find $\frac{d^2y}{dx^2}$

(III) Put $\frac{d^2y}{dx^2} = 0$

↳ find CP

$x = a, b, c$

(IV) Using wcm on $\frac{d^2y}{dx^2}$; Check Sign of $\frac{d^2y}{dx^2}$



a, b, c are pt

Question – CBSE 2024 PYQs

The point of inflexion of a function f(x) is the point where

A. $f'(x) = 0$ and f(x) changes its sign from positive to negative from left to right of that point.

B. f′(x)= 0 and f′(x) changes its sign from negative to positive from left to right of that point.

C. f′(x) = 0 and f′(x) does not change its sign from left to right of that point.

D. f′(x)≠ 0.





IMP. NOTE- 1 : For a Quadratic Equations

If we have $f(x) = ax^2 + bx + c$

↳ $a \equiv$ Coeff of x^2

$D = (b^2 - 4ac)$

(I) If $a > 0 \cap D < 0 \Leftrightarrow ax^2 + bx + c > 0$

(II) If $a < 0 \cap D < 0 \Leftrightarrow ax^2 + bx + c < 0$

Question – CBSE 2024 PYQs

The function $f(x) = x^3 - 3x^2 + 12x - 18$ is :

$f'(x) = 3x^2 - 6x + 12 > 0 \Rightarrow f'(x) > 0 \Rightarrow f(x)\uparrow$

$\Rightarrow 3\left[x^2 - 2x + 4\right]$

$a = 3 > 0$

$D = b^2 - 4ac$

$D \Rightarrow 36 - 144 < 0$

$\therefore a > 0 \cap D < 0$

A. Strictly decreasing on R

B. Strictly increasing on R

C. Neither strictly increasing nor strictly decreasing on R

D. Strictly decreasing on $(-\infty, 0)$

Question

The interval in which where the function $f(x) = x^3 - 3x^2 + 4x + 1, x \in \mathrm{R}$ is increasing, is :

A $[2,3]$

B $[-2,4]$

C $[0,3]$

D R

$f'(x) = 3x^2 - 6x + 4 > 0$

$a = 3 > 0$

$D = 36 - 48 < 0$

$a > 0 \cap D < 0 \Rightarrow$

$f'(x) > 0 \Rightarrow f(x) \uparrow \forall x \in R$



IMP. NOTE- 2 : Comparison BW two functions

Let we have Two fun $f(x)$ & $g(x)$

CASE 1 : If $f(x) > g(x) \Rightarrow f(x) > g_{MAX}$

CASE 2 : If $f(x) < g(x) \Rightarrow f(x) < g_{MIN}$

Question – CBSE 2024 PYQs

The function $f(x) = kx - \sin x$ is strictly increasing for

A. $k > 1$

B. $K < 1$

C. $K > -1$

D. $k < -1$

$\because f'(x) > 0$

$f'(x) \Rightarrow k - \cos x$

$\because f'(x) > 0$

$k - \cos x > 0$

$k > \cos x$

$k > [\text{Max Value of } \cos x]$

$k > 1$

Question – CUET 2025 PYQs

The function $f(x) = kx^3 + 6kx^2 + 18x + 17$ is increasing on $\mathbb{R}$ (set of real numbers) if:

A $k \in (0, 3)$

B $k \in (0, 3/2)$

C $k \in (1/2, 3/2)$

D $k \in (1/2, 5/2)$

$\because f'(x) = 3kx^2 + 12kx + 18$

$\because f(x)$ is $\uparrow$

$f'(x) > 0$

$3kx^2 + 12kx + 18 > 0$

$kx^2 + 4kx + 6 > 0$

$[ax^2 + bx + c > 0 \Downarrow a > 0 \cap D < 0]$

$\because k > 0$

$\because D < 0$

$b^2 - 4ac < 0$

$(4k)^2 - 4(k)(6) < 0$

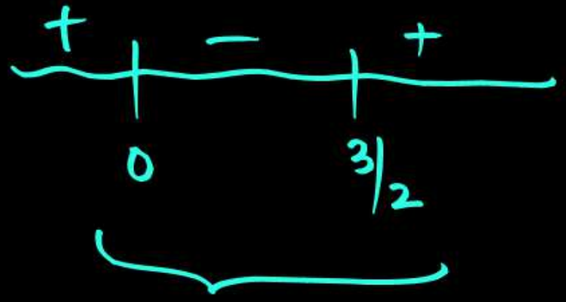
$16k^2 - 24k < 0$

$8k[2k - 3] < 0$

$k[2k - 3] < 0$

① $k > 0$ — $k > 0$

② $k(2k-3) < 0$



$k \in (0, 3/2) \Rightarrow D_2$

$D_1 \& D_2$

$D = D_1 \cap D_2$

$D_1 \cap D_2$

$k \in (0, 3/2)$

Ans

Q. The value of p for which the function $f(x) = \sin x - \cos x - px + q$ decrease for all real values of x is given by

(A) $p > \sqrt{2}$

(B) $p < \sqrt{2}$

(C) $p \geq 1$

(D) $p < 1$

$\because f'(x) = \cos x + \sin x - p$

$\because f(x)$ is $\downarrow$

$f'(x) < 0$

$(\cos x + \sin x) - p < 0$

$(\cos x + \sin x) < p$

$p > (\sin x + \cos x)$

$p > [\text{Max Value of } (\sin x + \cos x)]$

$\underline{p > \sqrt{2}}$

\# $-\sqrt{a^2+b^2} \leq a\sin x \pm b\cos x \leq \sqrt{a^2+b^2}$

$-\sqrt{2} \leq \sin x + \cos x \leq \sqrt{2}$

Question

The function $f(x) = x^3 + 6x^2 + (9 + 2k)x + 1$ is strictly increasing for all x, if



A $k > \frac{3}{2}$

B $k \geq \frac{3}{2}$

C $k < \frac{3}{2}$

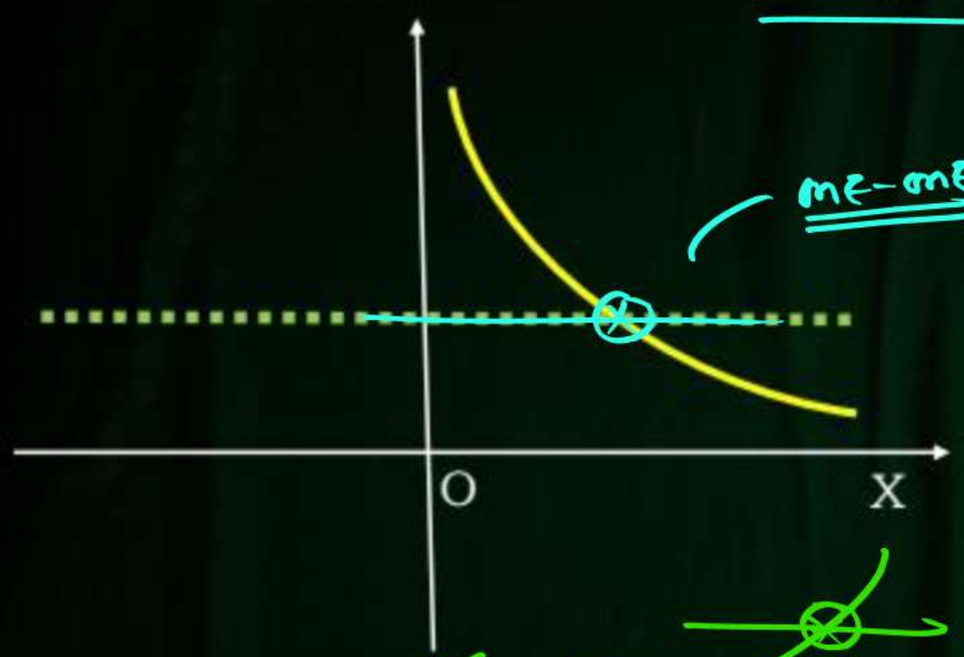
D $k \leq \frac{3}{2}$

SSR SIR

APPLICATION: Concept of the Monotonicity

Testing of one-one fun

Horizontal line Testing.



$y = \sin x$

$\frac{dy}{dx} = \cos x > 0$

$f'(x) > 0$

$f(x)$

$-1 \le \sin x \le 1$

$-1 \le -\sin x \le 1$

$4 \le (3 - \sin x) \le 6$



- **Testing of ONE ONE Function:** If a function is either strictly increasing or strictly decreasing, it will be One One Function.

Question – CUET 2025 PYQs

$1+\tan^2 x = \sec^2 x$

$\sec^2 x - 1 = \tan^2 x$

The function $f(x) = \tan x - x$

$f'(x) = \sec^2 x - 1 = \tan^2 x > 0$

$\uparrow \; [0, \frac{\pi}{2})$

A is a decreasing function on $\left[0, \frac{\pi}{2}\right)$

B is an increasing function on $\left[0, \frac{\pi}{2}\right)$

C is a constant function

D is neither increasing nor decreasing function on $\left[0, \frac{\pi}{2}\right)$

Question – CUET 2025 PYQs

If the interval in which the function $f(x) = 4x^3 - 6x^2 - 72x + 30$ is strictly decreasing, is (a, b) then $a + b$ is equal to

(A) ∞

(B) 0

(C) 1

(D) 2

$(-2, 3)$

$-2 + 3 = 1$

$f'(x) = 12x^2 - 12x - 72$

$\Rightarrow 12[x^2 - x - 6]$

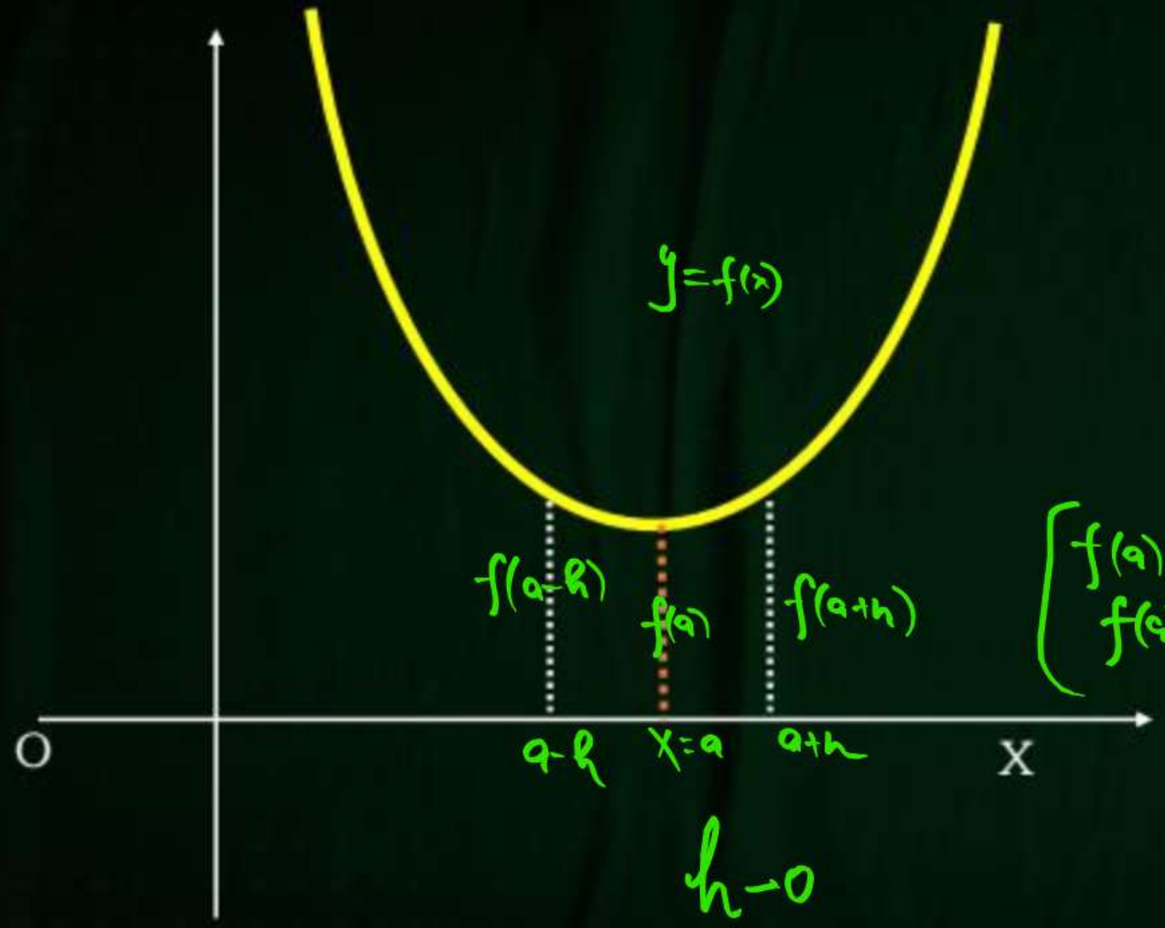
$\Rightarrow 12[x^2 - 3x + 2x - 6]$

$\Rightarrow 12(x-3)(x+2)$



SSR SIR

Local Minima or Relative Minima



A function f(x) is said to local or relative miima at x = a, if there exists a very small positive number, h such that

$$\begin{bmatrix} f(a) < f(a+h) \\ f(a) < f(a-h) \end{bmatrix} \cap$$

$$f(x) < f(a-h) \quad \& \quad f(x) < f(a+h)$$

x=a is pt of L-min



CRITICAL POINT(CP)

CP: $\frac{dy}{dx}=0$ for diff fun ✓ $f'(x)$ = DNE for N.D.

- ✓ The value of the 'x' within the domain of the function f(x) for which f'(x) – 0 or f'(x) = DNE
- ❖ Critical point of a function is any value in the domain where either the function is not differentiable or derivative is ZERO

8) Find No. of CPs of

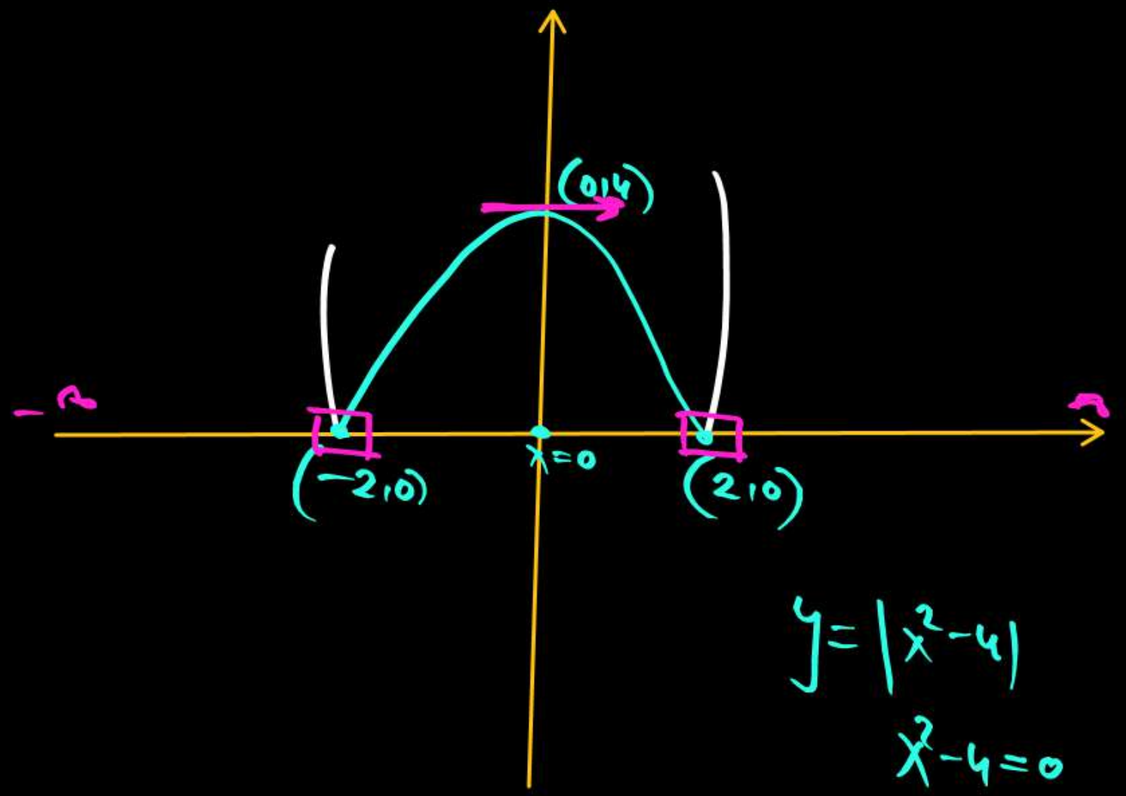
$$y = |x^2 - 4|$$

In $y = x^2 - x^2 - 4$

a) $x \in R$: 3 CPs : $x = \pm 2, x = 0$

b) $x \in (0, \infty)$: 1 CP $\rightsquigarrow x = 2$

c) $x \in (-\infty, 0)$: 1 CP : $x = -2$



$y = |x^2 - 4|$

$x^2 - 4 = 0$

$x = \pm 2$

Q) $y = |x-1| + |x-2|$

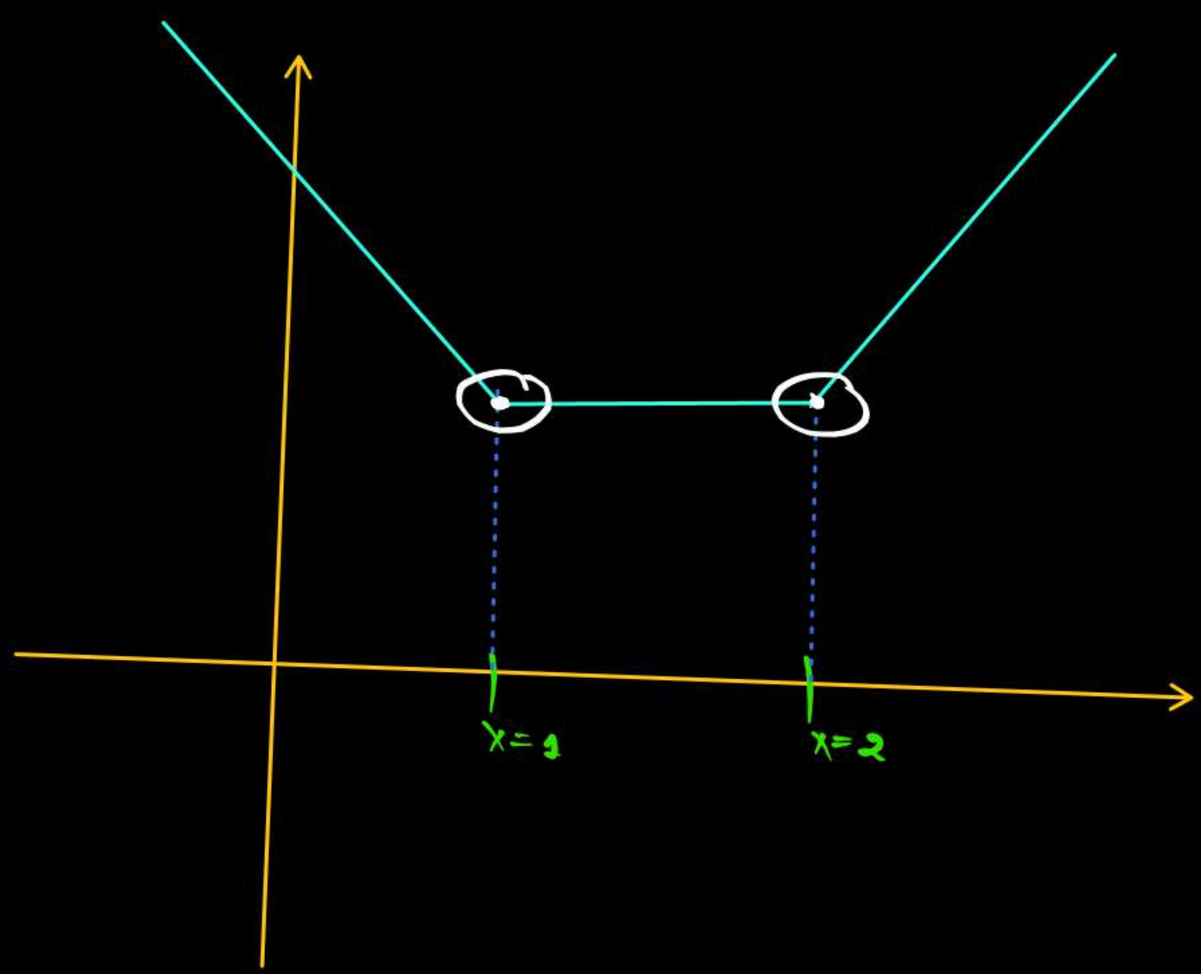
(1) find CP

$x-1=0 \Rightarrow x=1$

$x-2=0 \Rightarrow x=2$

$y(1) = 0+1 = 1$

$y(2) = 1+0 = 1$



Q) $y = |x^2 - 5x + 6|$

Write All CPs.

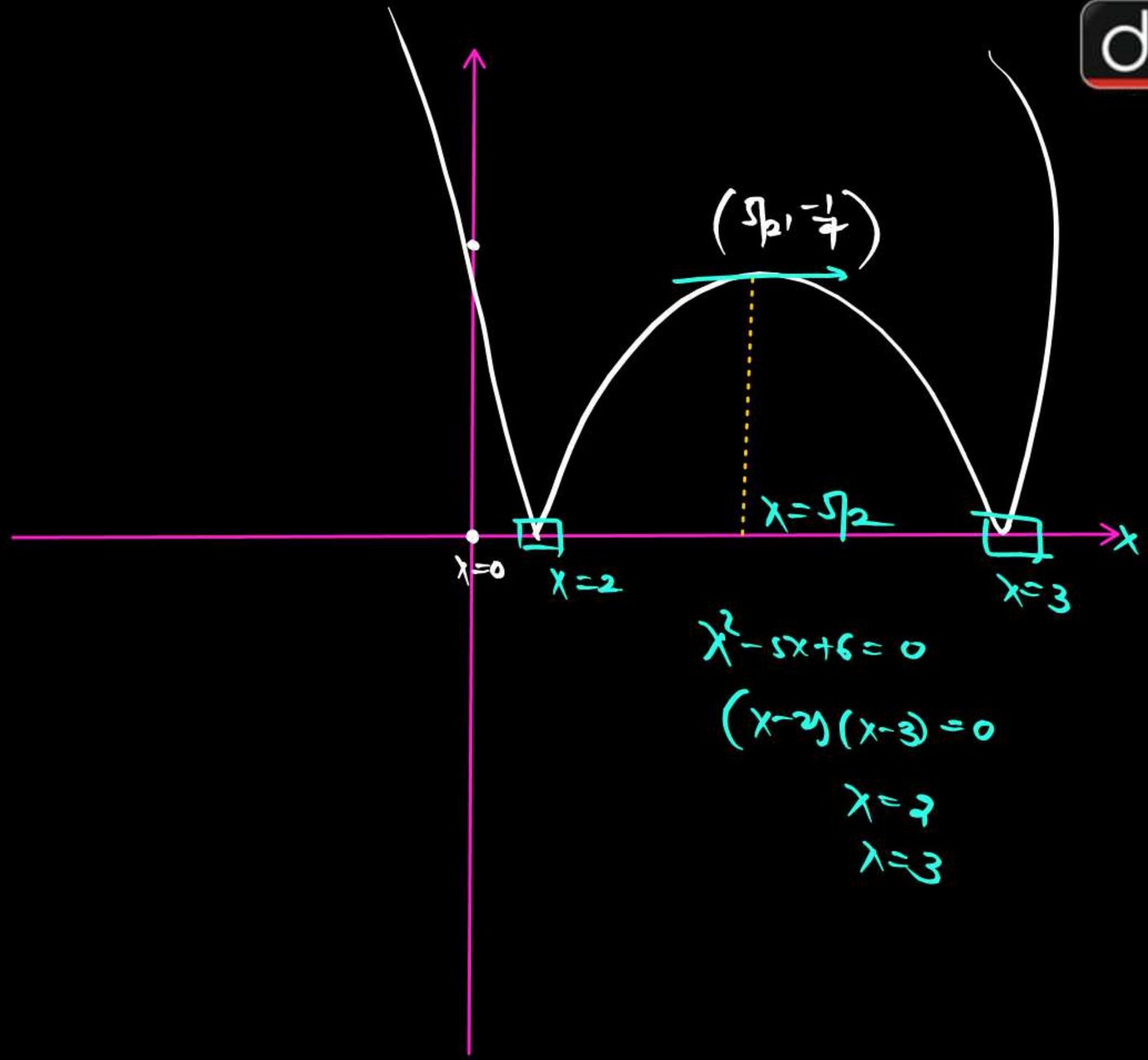
\# Graph of $y = x^2 - 5x + 6$

(I) $a = 1 > 0$ ∪

(II) $V \equiv \left[\frac{-b}{2a}, \frac{-D}{4a}\right] \Rightarrow \left[\frac{5}{2}, \frac{-1}{4}\right]$

$D = b^2 - 4ac \Rightarrow 25 - 24 = 1$

(III) at $x = 0$; $y = 6$



$x^2 - 5x + 6 = 0$

$(x-2)(x-3) = 0$

$x = 2$

$x = 3$

Q)

$y = |x^2| - 5|x| + 6$

Write All CPs.

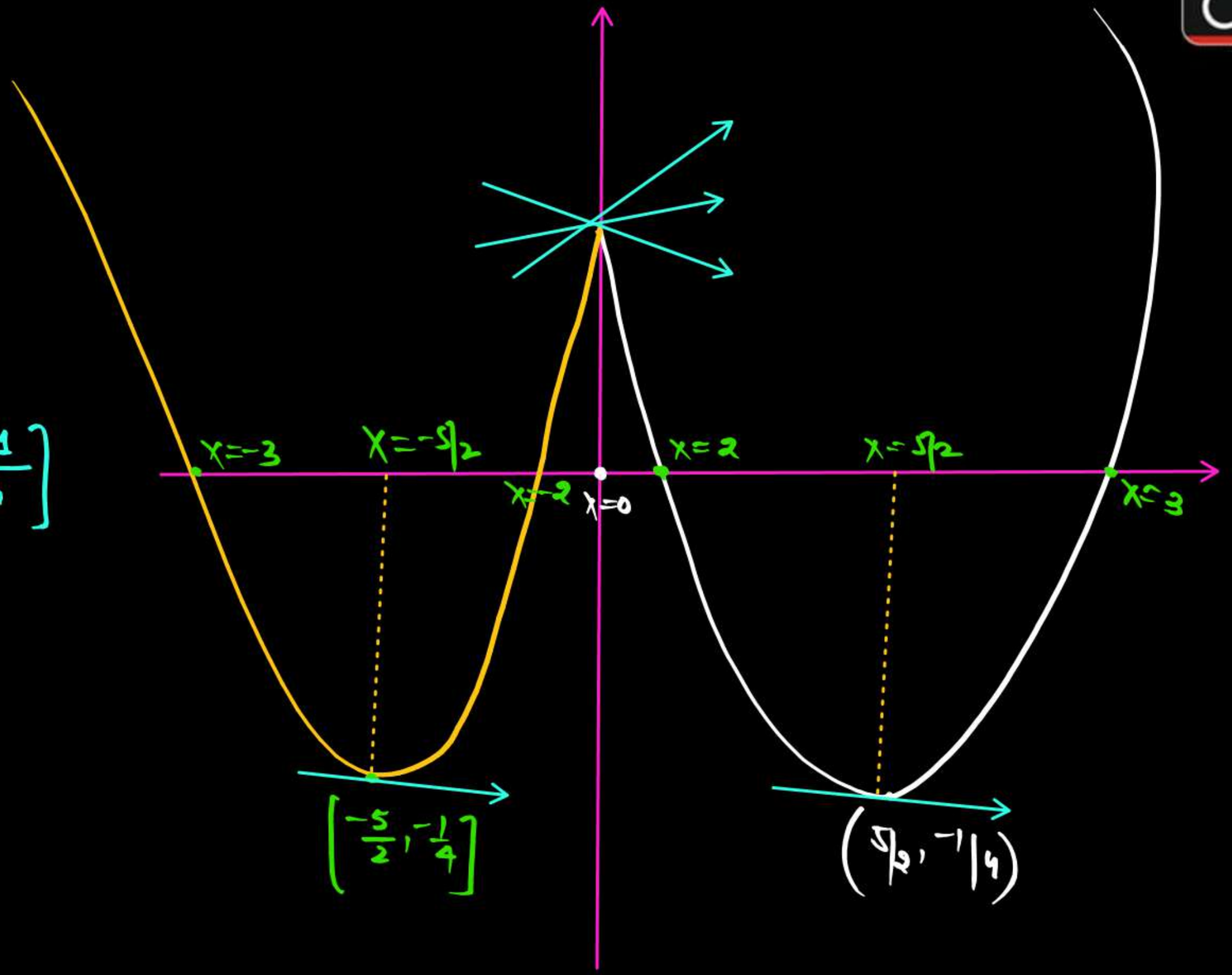
\# Graph of $y = x^2 - 5x + 6$

(I) $a = 1 > 0$ ∪

(II) $V \equiv \left[\frac{-b}{2a}, \frac{-D}{4a}\right] \Rightarrow \left[\frac{5}{2}, \frac{-1}{4}\right]$

$D = b^2 - 4ac \Rightarrow 25 - 24 = 1$

(III) at $x = 0$; $y = 6$



Q) $y = |x^2 - 5|x| + 6|$

Write All CPs.

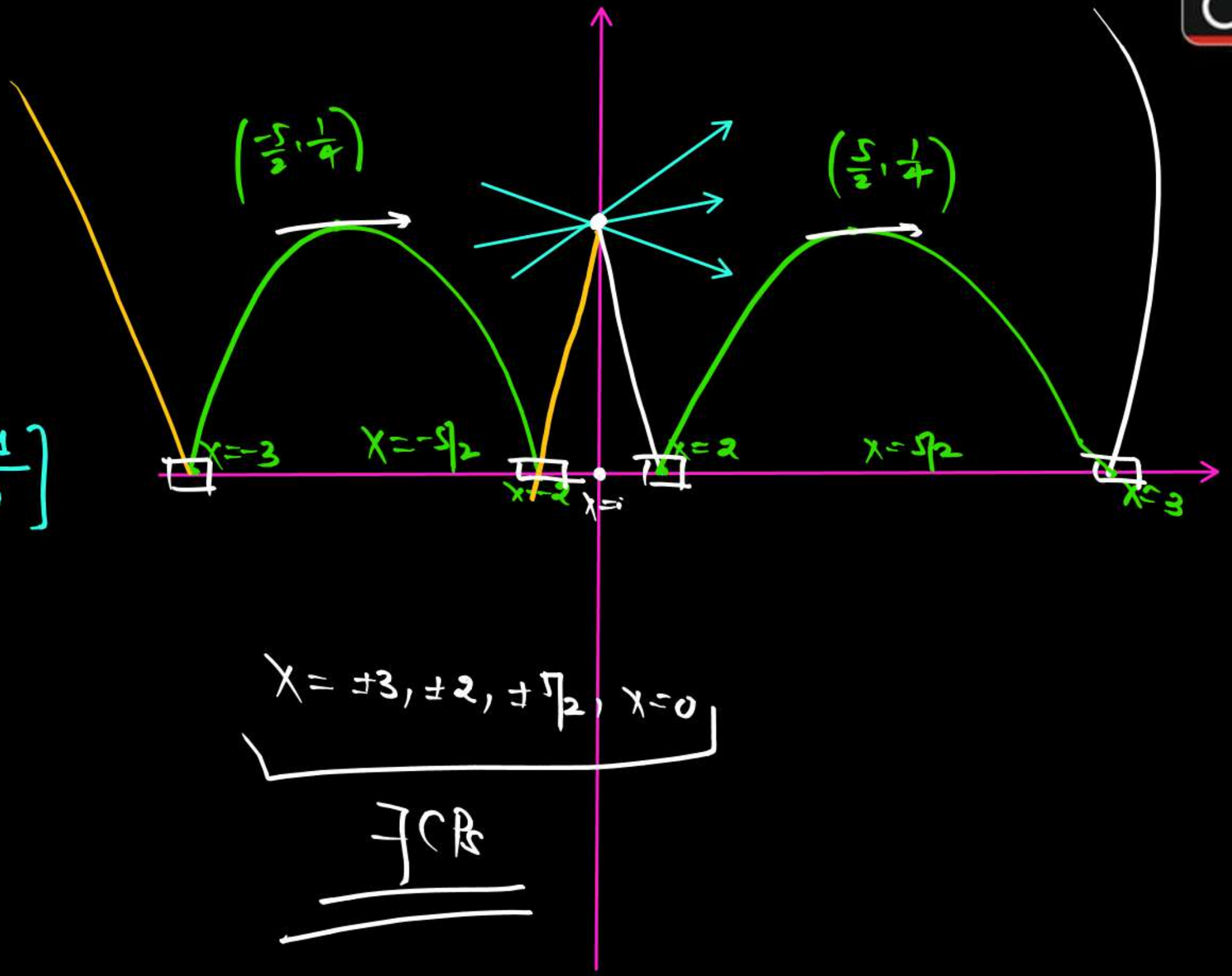
\# Graph of $y = x^2 - 5x + 6$

(I) $a = 1 > 0$ ∪

(II) $V \equiv \left[\frac{-b}{2a}, \frac{-D}{4a}\right] \Rightarrow \left[\frac{5}{2}, \frac{-1}{4}\right]$

$D = b^2 - 4ac \Rightarrow 25 - 24 = 1$

(III) at $x = 0$; $y = 6$



$x = \pm 3, \pm 2, \pm \frac{5}{2}, x = 0$

7 CPs

Question

The critical points of $f(x) = x^3 + x^2 + x + 1$ are

$\frac{dy}{dx} = 3x^2 + 2x + 1 > 0$

$a = 3$

$D < 0$



A 2,1

B $-2, -1$

C $2, -1$

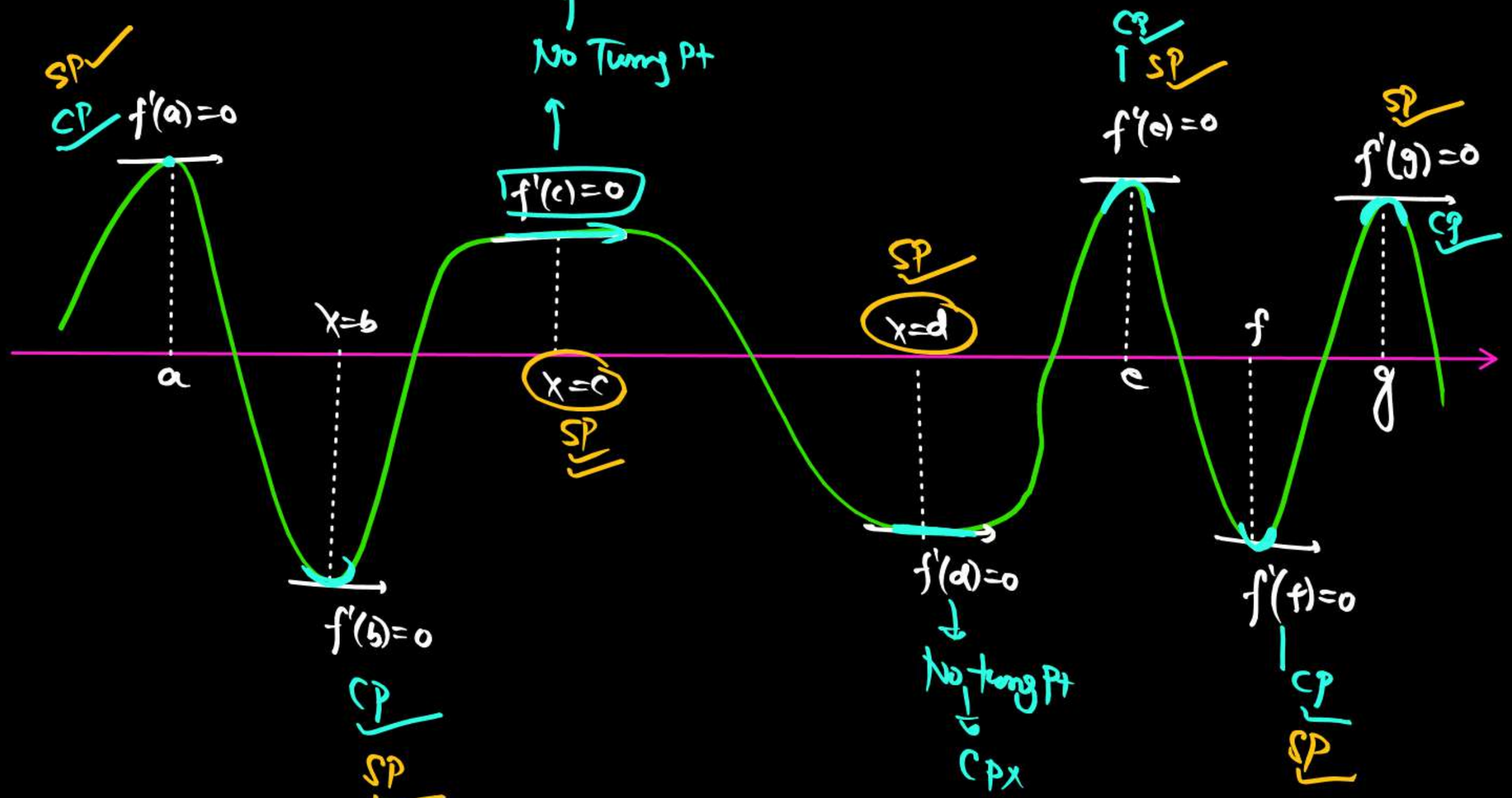
D do not exist

$y = f(x)$

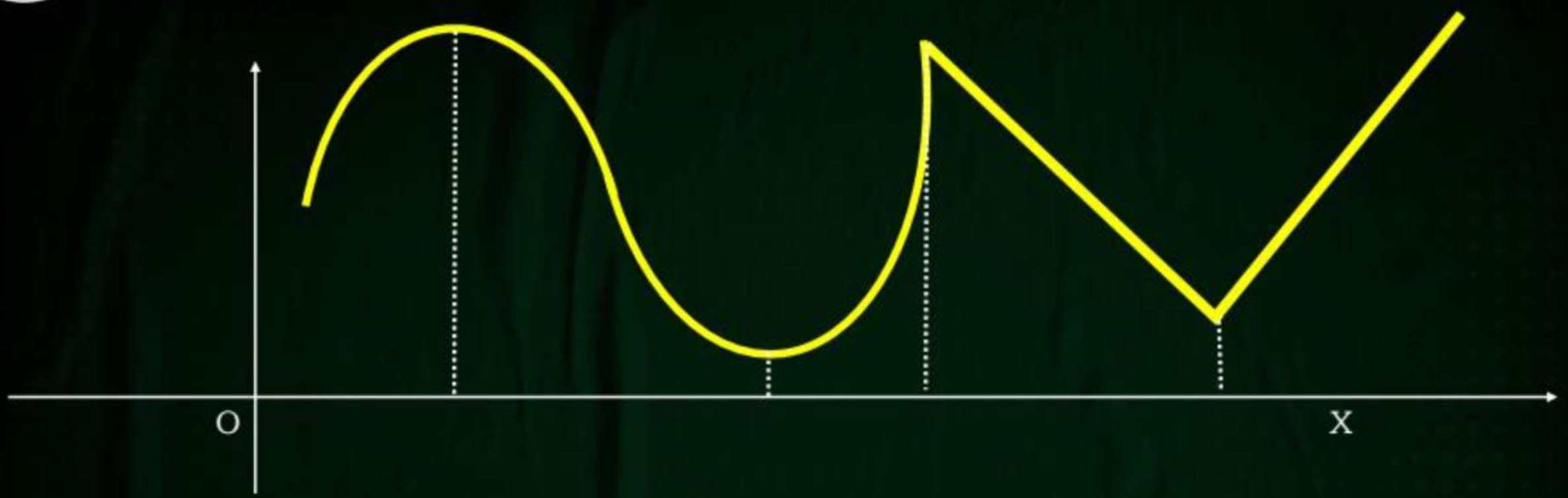
Stationary Point: $\frac{dy}{dx} = 0$

C-P ≡ Turning Pt

$f'(x) = 0$



Stationary Point



❖ Points where $\frac{dy}{dx} = 0 \Rightarrow$ are known as stationary points

Question

$f(x) = x^x$ has a stationary point at

[(CBSE Sample Paper 2022) (Term - 1)]

A $x = e$

B $x = \frac{1}{e}$

C $x = 1$

D $x = \sqrt{e}$

$y = x^x$

$\frac{dy}{dx} = x^x(1 + \log x)$

for SP

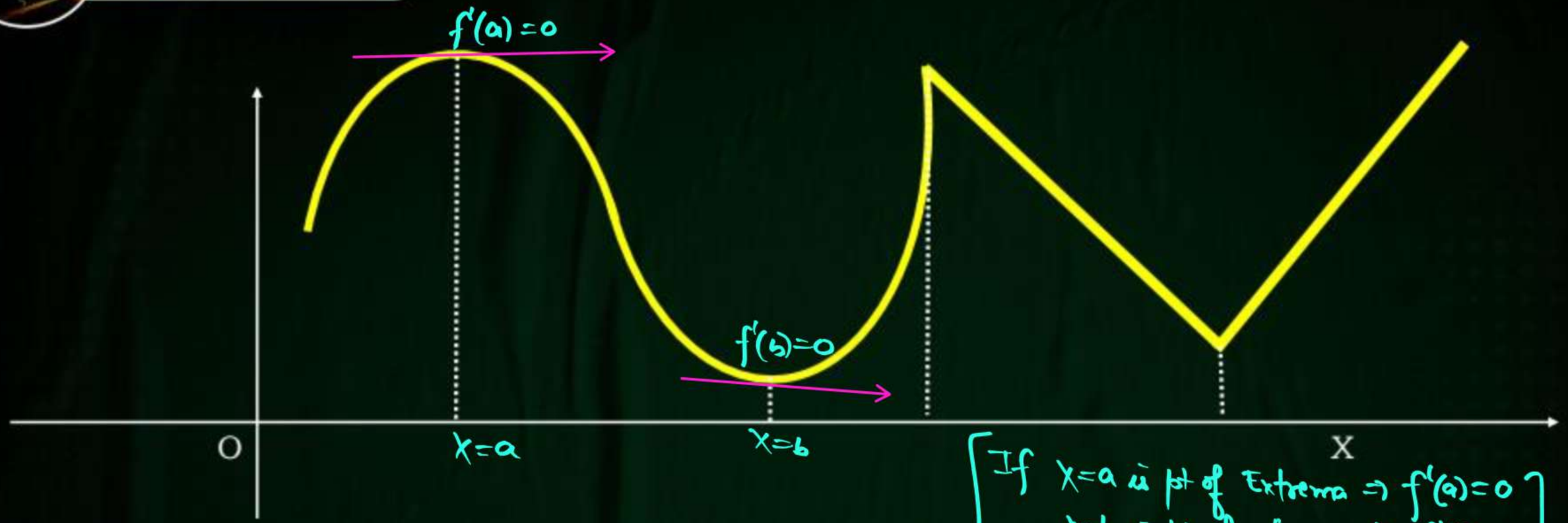
$\frac{dy}{dx} = 0$

$x^x(1 + \log x) = 0$

$x = 1/e$

CMD

EXTREAMA ⇒ Either Local Max (or) Local Min



[If X = a is pt of Extrema ⇒ f'(a) = 0
X = b is pt of " ⇒ f'(b) = 0]

- ✓ EXTREMA = MAXIMA or MINIMA
- ✓ LOCAL EXTREMA = LOCAL MAXIMA or LOCAL MINIMA

NOTE: *A Necessary Condition :* A point x = a is an extreme point of a function f(x) if f' (a) = 0; provided f' (a) exists

Question – CUET 2025 PYQs

If it is given that at $x = 1$, the function $f(x) = x^4 - 62x^2 + 2ax + 8$ attains its maximum value on the interval $[0, 2]$, then the value of a is:

A 120

B 60

C 0

D -60

$2a = 120$

$a = 60$

SSR SIR

Question

2023

If the function $f(x) = x^4 - 62x^2 + ax + 9$ attains its local maximum value at $x = 1$, then a is equal to :



$f'(x) = 4x^3 - 124x + a$

$f'(1) = 0$

$4 - 124 + a = 0$

$a = 120$

A 120

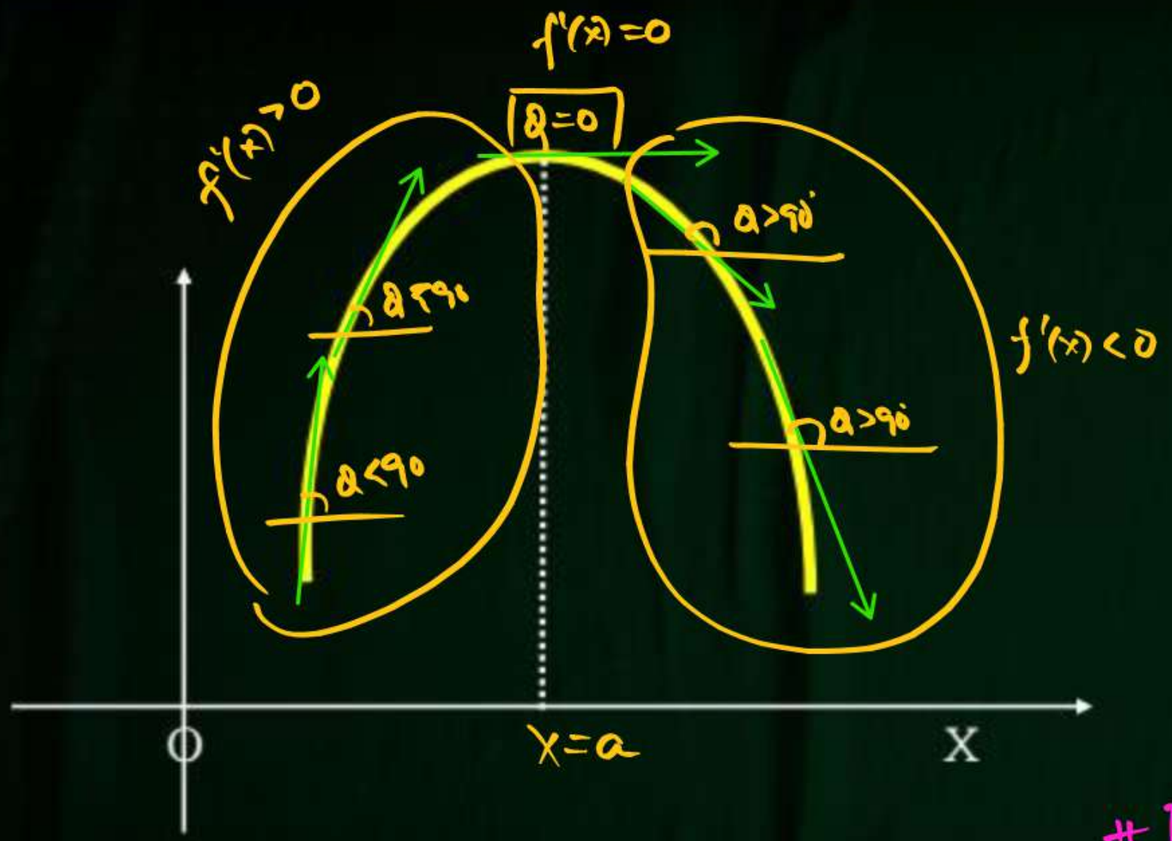
B 110

C 100

D 90



1st Order Derivative Testing of Maxima



Sign of f'(x)



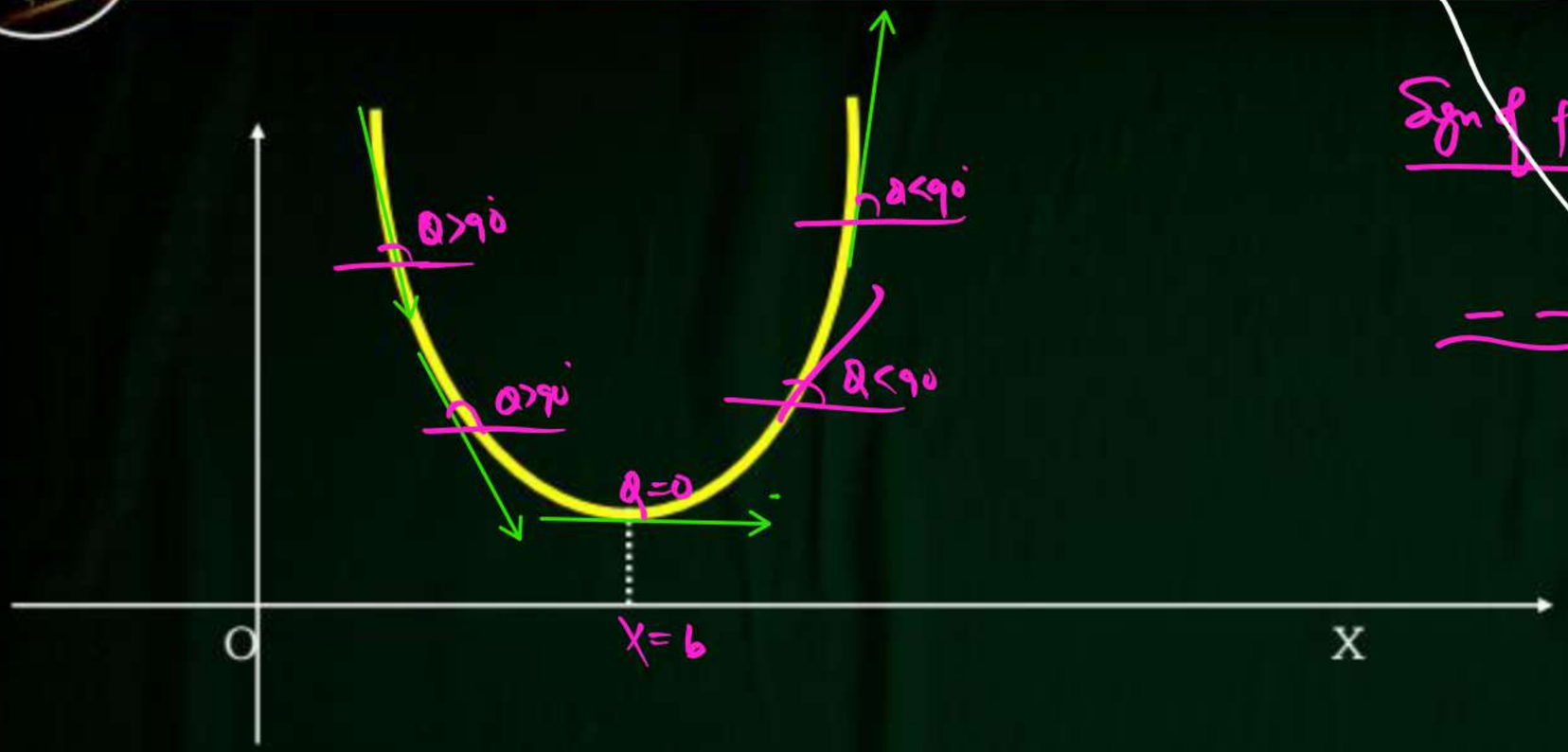
- # X=a is pt of local MAX
- # MAX Value : f(a)

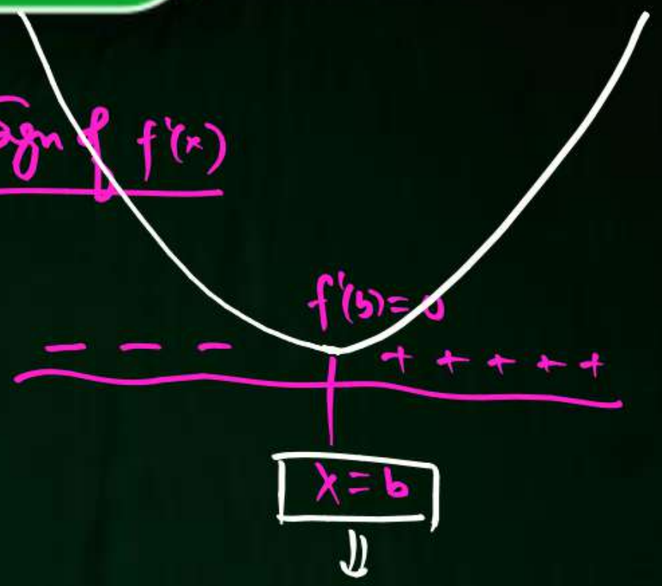
Point of MAX | Min — X ki Value

# MAXIMUM | Minimum Value ⇒ y ki Value
y = f(x)



1st Order Derivative Testing of Minima

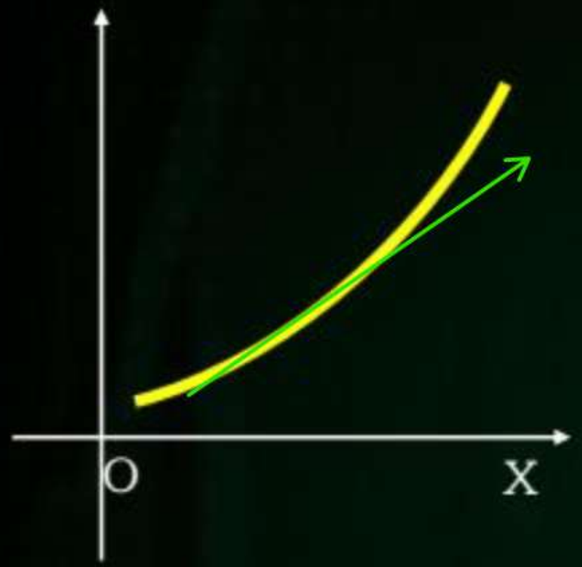


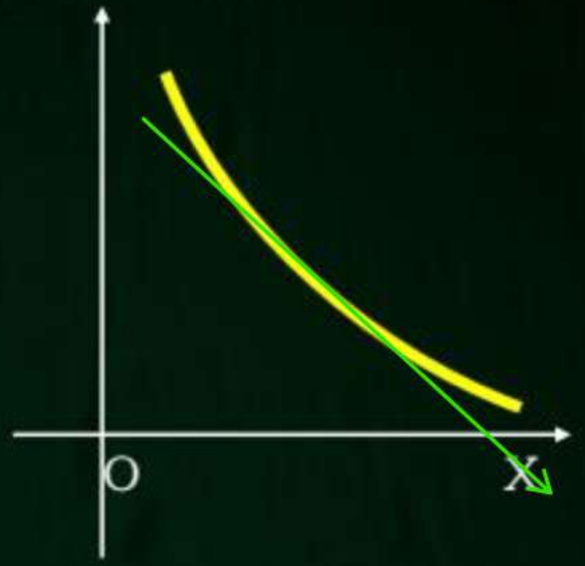


* $x=b$ is pt of local Min
* Min Value: $f(b)$



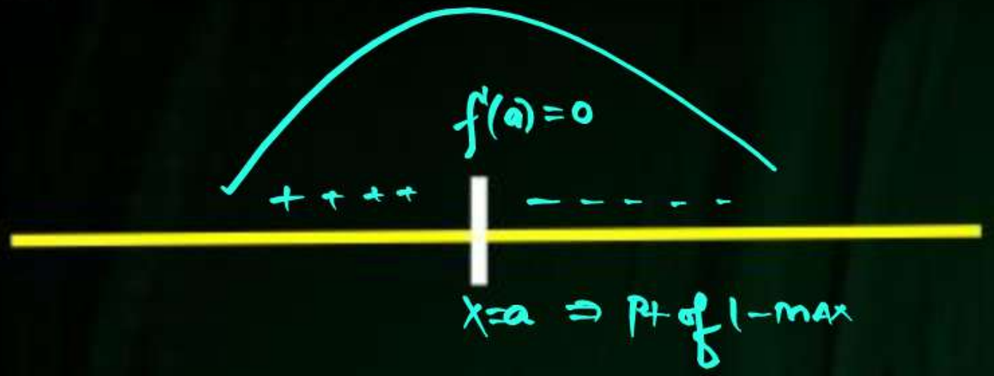
Neither Maxima Nor Minima

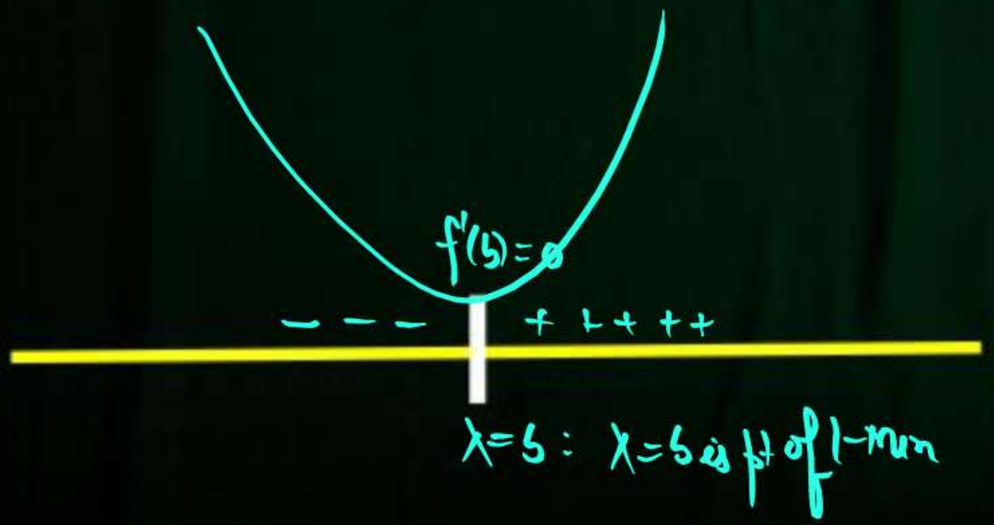






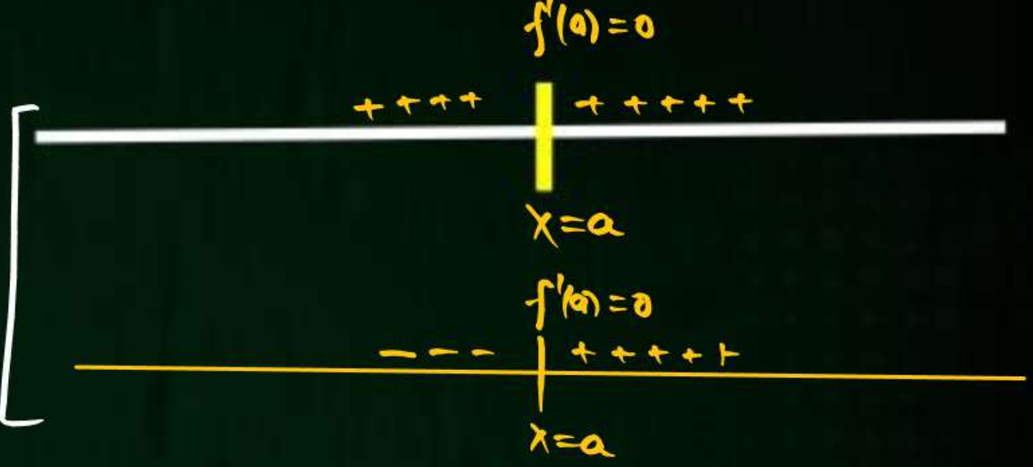
IMP. NOTE: Sign of f'(x)

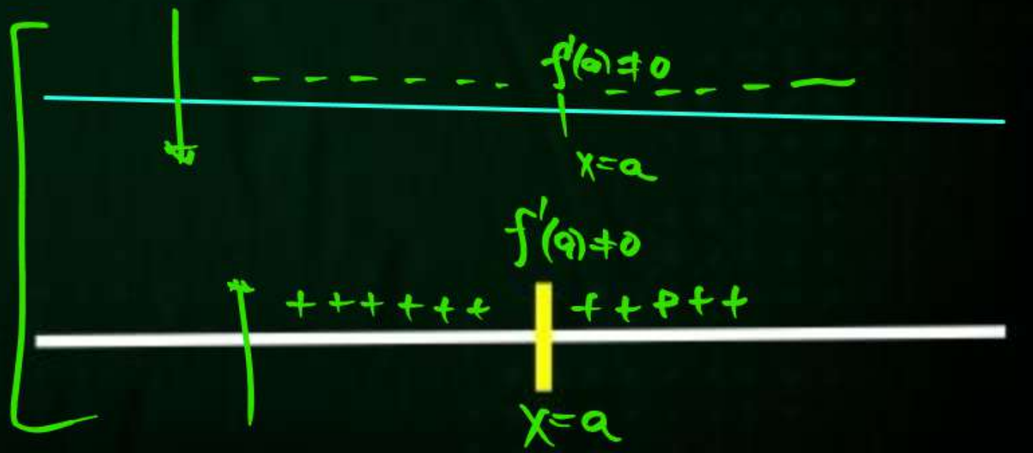




Neither L-MAX nor L-min

POI





Important Steps – Local Maxima/Minima using 1st order derivatives

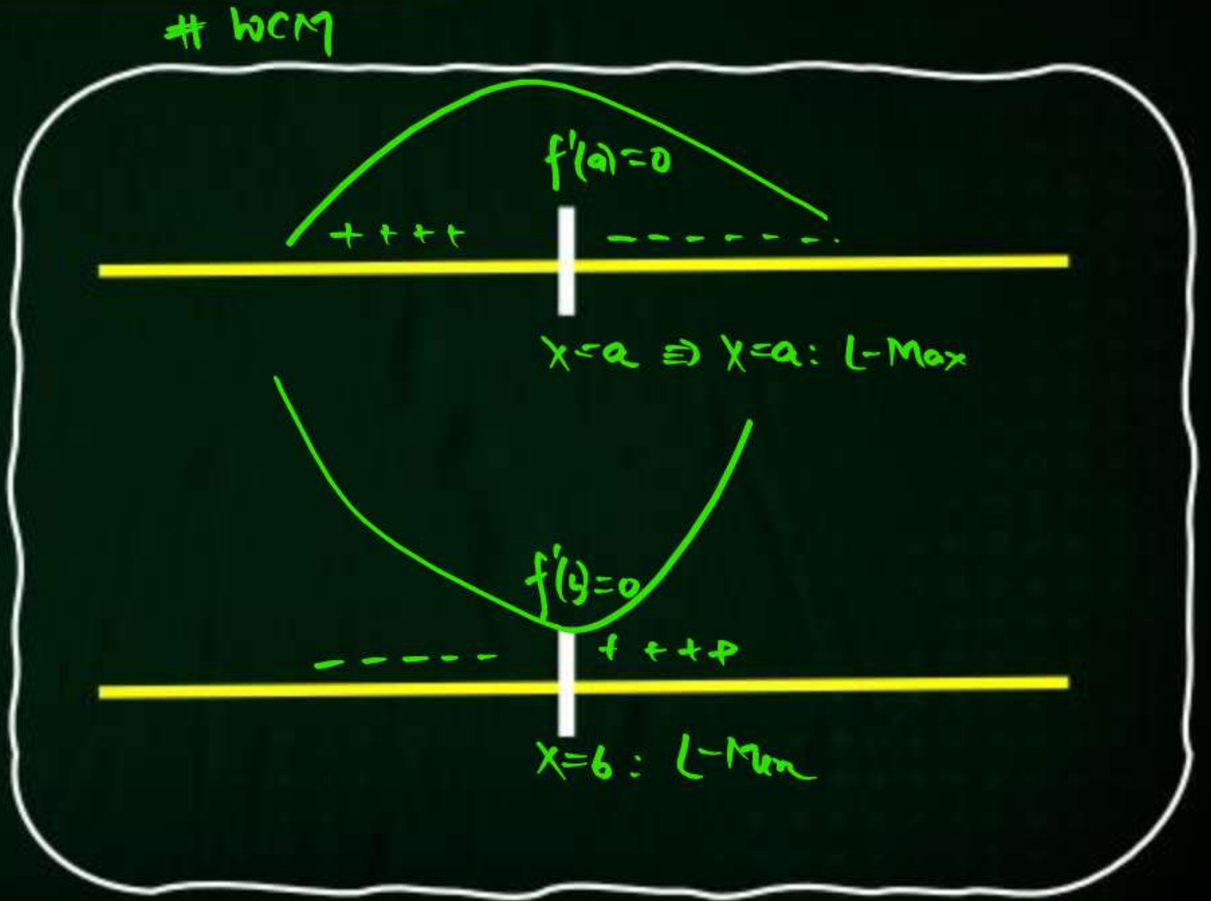
Let we have a function $y = f(x)$ is defined in the defined domain

Step1: Find f'(x) $\frac{dy}{dx}$

Step 2: Find Critical Point(CP)

$$f'(x) = 0 \quad \frac{dy}{dx} = 0$$

Step 3: Use 1st order derivative testing.



Question

Max Value: $f(-1) =$ ____

Min Value: $f(2) =$ ____

The function $f(x) = 2x^3 - 3x^2 - 12x + 4$ has :

(I) $f'(x) = 6x^2 - 6x - 12$

$f'(x) = 6[x^2 - x - 2]$

$\Rightarrow 6[x^2 - 2x + x - 2]$

$\Rightarrow 6(x-2)(x+1)$

(II) for CP

$f'(x) = 0$

$x = 2$

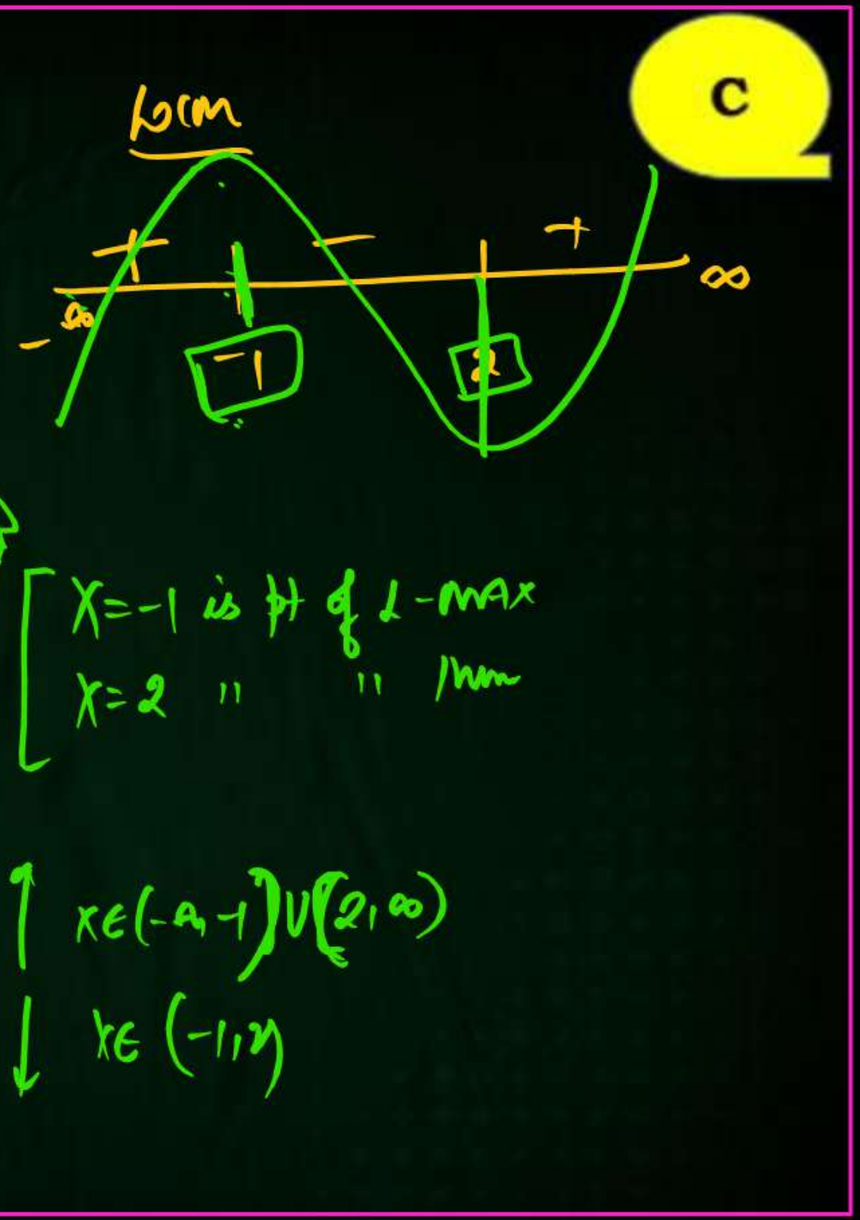
$x = -1$

A two points of local minimum

B two points of local maximum

C one maxima and one minima

D no maxima or minima





2nd Order Derivative Testing of Maxima/Minima

Let we have a function $y = f(x)$ is defined in the defined domain

Step1: Find f'(x) → $\frac{dy}{dx}$

Step 2: Find Critical Point(CP)

$f'(x) = 0$ $\quad \frac{dy}{dx} = 0$

$x = a, b, \ldots$

Step 3: Find f''(x) ?

$\frac{d^2y}{dx^2} = ?$

CASE 1: If $f''(x) < 0$ at any critical point (Let's say $x = a$), then $x = a$ will be point of **maxima**

CASE 2: If $f''(x) > 0$ at any critical point (Let's say $x = b$), then $x = b$ will be **point of minima**

Question: CUET 2026 PYQs

The **maximum value** of $f(x) = -x^2 + 2x + 4, x \in R$ (set of real numbers) is

A. -5
B. 5
C. -7
D. 7

(I) $f'(x) = -2x + 2$

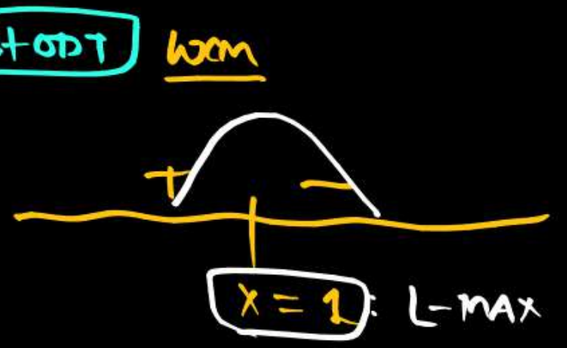
(II) two CP

$f'(x) = 0$

$-2x + 2 = 0$

$x = 1$

$f(1) = -1 + 2 + 4 \Rightarrow 5$



2nd ODT

$f''(x) = -2$

at $x = 1 \Rightarrow f''(1) = -2 < 0$

$x = 1$ is pt of L-MAX

Question: CUET 2026 PYQs

The maximum and the minimum value of the function

$f(x) = -||x + 3| - 5| + 2$ **are:**

$y=|x| \rightarrow |x+3| \rightarrow |x+3|-5 \rightarrow \left||x+3|-5\right| \rightarrow -\left||x+3|-5\right|$

$\downarrow$

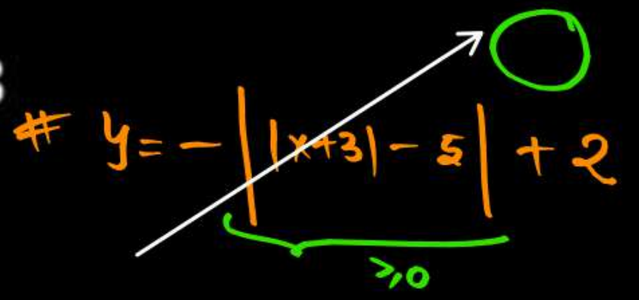
$-|x+3|-5|+2$

(A) **Max** $[f(x)] = 7$; **Min** $[f(x)] = 2$

(B) **Max** $[f(x)]$ **= doesn't exist; Min.** $[f(x)] = -3$

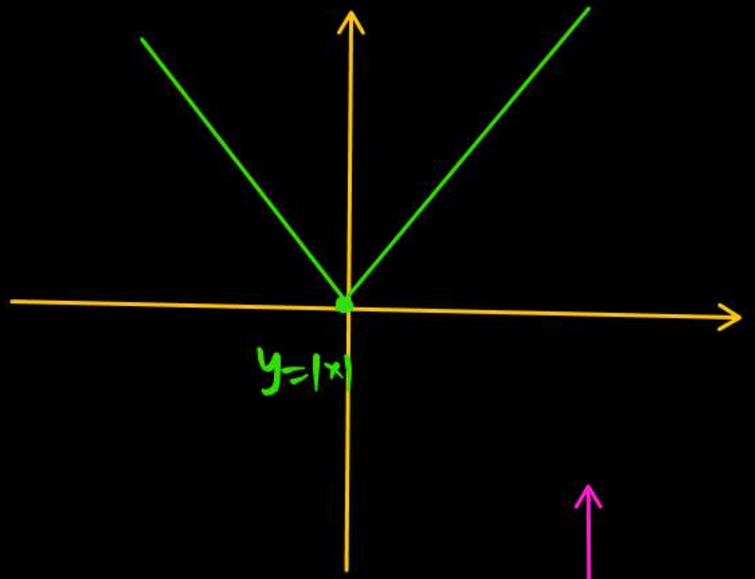
(C) **Max** $[f(x)]$ **= doesn't exist; Min.** $[f(x)] = 2$

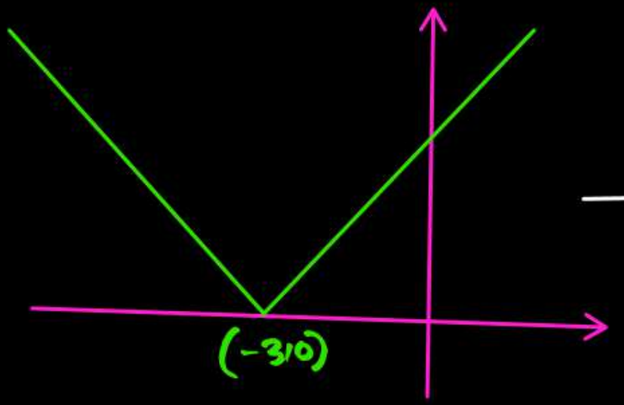
(D) **Max** $[f(x)] = 2$; **Min** $[f(x)]$ **= doesn't exist**

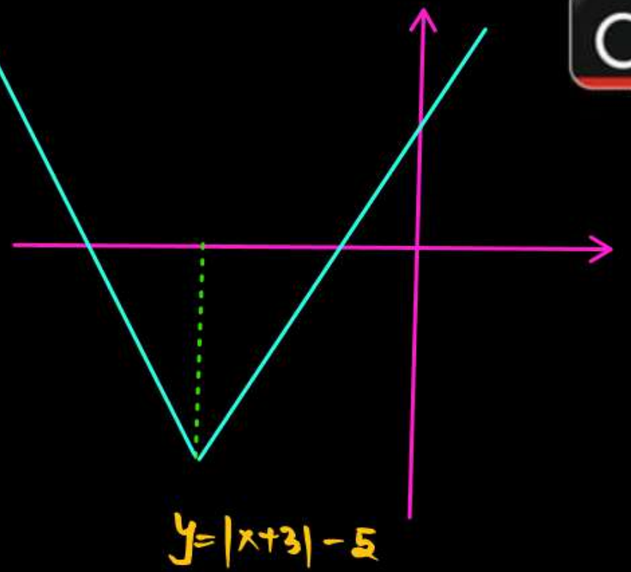


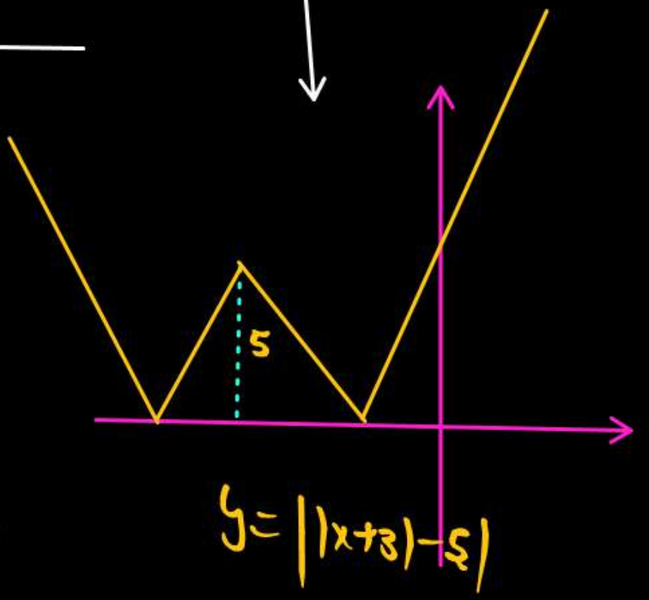
* MAX Value : $y = 2$

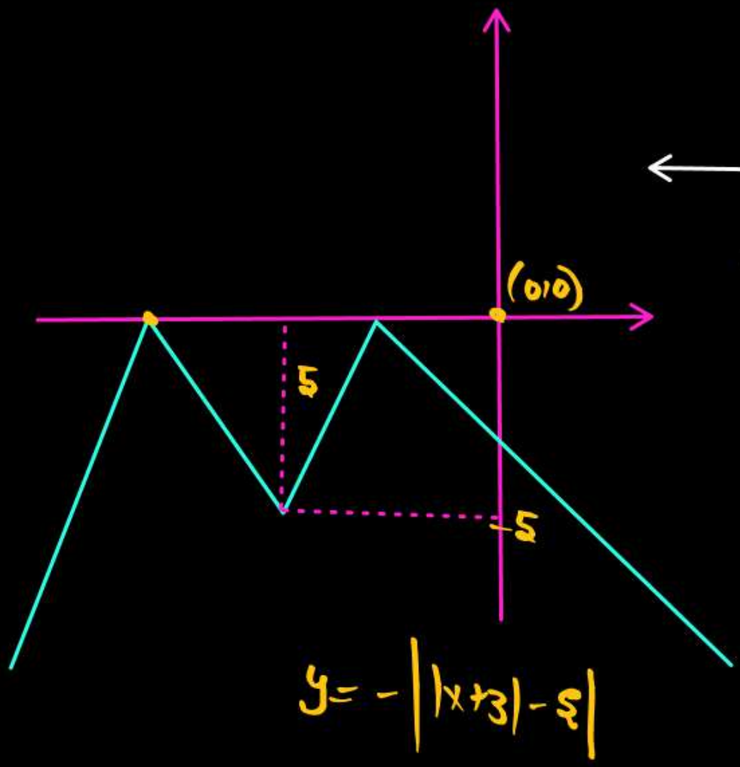


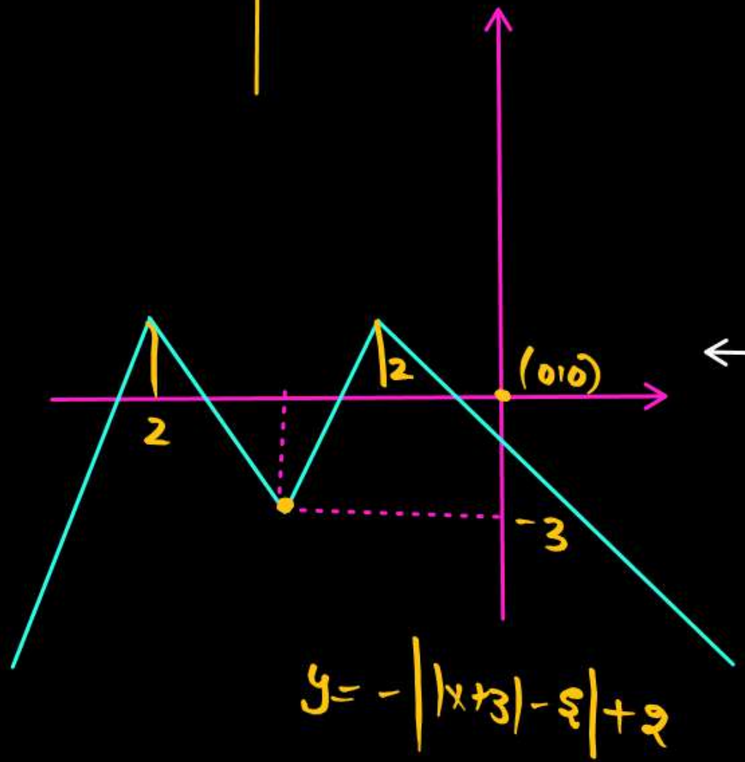

y=|x|


(-3,0)
y=|x+3|


y=|x+3|-5


5
y=||x+3|-5|


(0,0)
5
-5
y=-||x+3|-5|


2
2
(0,0)
-3
y=-||x+3|-5|+2

Question: CUET 2026 PYQs

The maximum value of $f(x) = \dfrac{1}{3(x^2 - x + 1)}$ is:

(A) $\frac{9}{4}$

(B) $\frac{4}{9}$

(C) $\frac{1}{2}$

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

MAX

$g(x)_{min} = 3(x^2 - x + 1)$

$g(x) \Rightarrow 3x^2 - 3x + 3$

$a > 0$

$m \Rightarrow \frac{-D}{4a} \Rightarrow -\frac{[9-36]}{12} \Rightarrow \frac{27}{12} \Rightarrow \frac{9}{4}$

$g_{min} = 9/4$

$f_{MAX} = \frac{1}{g_{min}}$

$\Rightarrow \frac{1}{(9/4)}$

$\Rightarrow 4/9$

Question: CUET 2026 PYQs

For the function $f(x) = 2x^3 - 3x^2 - 12x + 5$. Which of the following statements is/are TRUE?

(A) Function $f(x)$ has two points of local maximum ✗

(B) Function $f(x)$ has two points of local minimum ✗

(C) Function $f(x)$ has one local maxima and one local minima

(D) Function $f(x)$ has local maxima at $x = -1$

Choose the correct answer from the options given below:

A (C) and (D) only

B (A), (B) and (C) only

C (B), (C) and (D) only

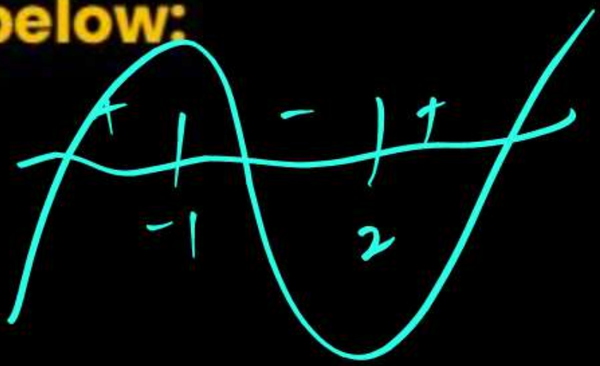
D (A), (B) and (D) only

$f'(x) = 6x^2 - 6x - 12$

$\Rightarrow 6[x^2 - x - 2]$

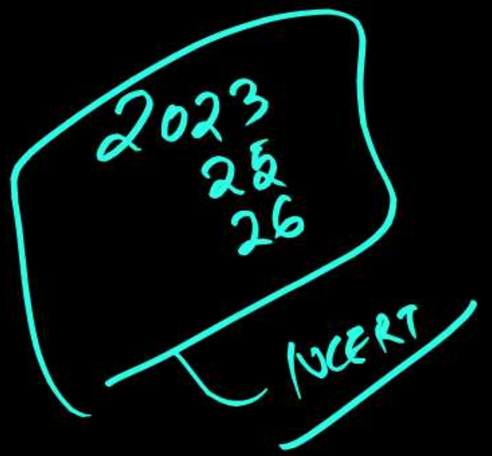
$\Rightarrow 6[x^2 - 2x + x - 2]$

$\Rightarrow 6(x-2)(x+1)$



Question: CUET 2026 PYQs

If the function $f(x) = x^4 - 62x^2 + ax + 9$ has a critical point at $x = 1$, then a is equal to:



A. 120

B. 110

C. 100

D. 90

Question: CUET 2026 PYQs

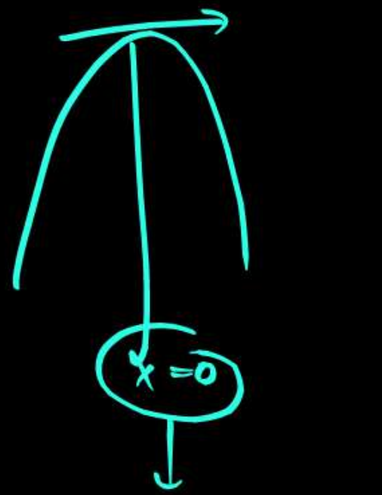
If $f(x) = x^3 + px^2 + qx - 3$ has a local maxima at $x = 0$ and local minima at $x = 1$, then the values of p and q respectively, are:

A. 3 and -3

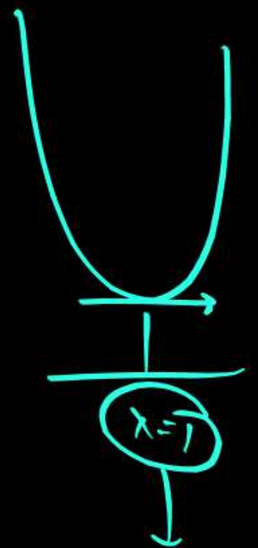
B. -3/2 and 0

C. -3 and 3

D. 0 and -3/2



① $f'(1) = 0$



② $f(1) = 0$

$f'(x) = 3x^2 + 2px + q$

① $f'(0) = 0$

$0 + 2p(0) + q = 0$

$q = 0$

② $f'(1) = 0$

$3 + 2p + q = 0$

$3 + 2p + 0 = 0$

$p = -3/2$

Question: CUET 2026 PYQs

If $y = a \log x + bx^2 + x$ has extreme values at $x = 1$ and $x = 2$, then

A $a = \frac{2}{3}, b = -\frac{1}{6}$

B $a = -\frac{2}{3}, b = \frac{1}{6}$

C $a = -\frac{2}{3}, b = -\frac{1}{6}$

D $a = \frac{2}{3}, b = \frac{1}{6}$

$\frac{dy}{dx} = a \cdot \frac{1}{x} + 2bx + 1$

$f'(1) = 0 \rightarrow a + 2b + 1 = 0$

$f'(2) = 0 \rightarrow \frac{a}{2} + 4b + 1 = 0$

$a + 8b + 2 = 0$

$a + 8b + 2 = 0$

$a + 2b + 1 = 0$

$6b + 1 = 0$

$b = -\frac{1}{6}$

$a + 2\left(-\frac{1}{6}\right) + 1 = 0$

$a + \frac{2}{3} = 0$

$a = -\frac{2}{3}$

Question: CUET 2026 PYQs

For the function $f(x) = 2x^3 - 21x^2 + 36x - 20$, which of the following statements are correct?

(A) $x = 6$ is a point of local minimum.

(B) $x = 2$ is a point of local maximum.

(C) The local minimum value is -105.

(D) The local maximum value is -3.

Choose the correct answer from the options given below:

A (B) and (C) only

B (A) and (D) only

C (A) and (B) only

D (B) and (D) only

$f'(x) = 6x^2 - 42x + 36$

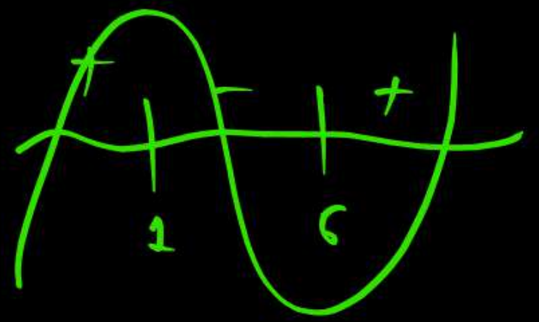
$\Rightarrow 6[x^2 - 7x + 6]$

$\Rightarrow 6(x-6)(x-1)$

for CP

$x = 6$

$x = 1$



Question – CUET 2025 PYQs

The maximum value of $f(x) = \frac{1}{4x^2+2x+1}$ is



$\frac{3}{4}$



$\frac{4}{3}$



$\frac{2}{3}$



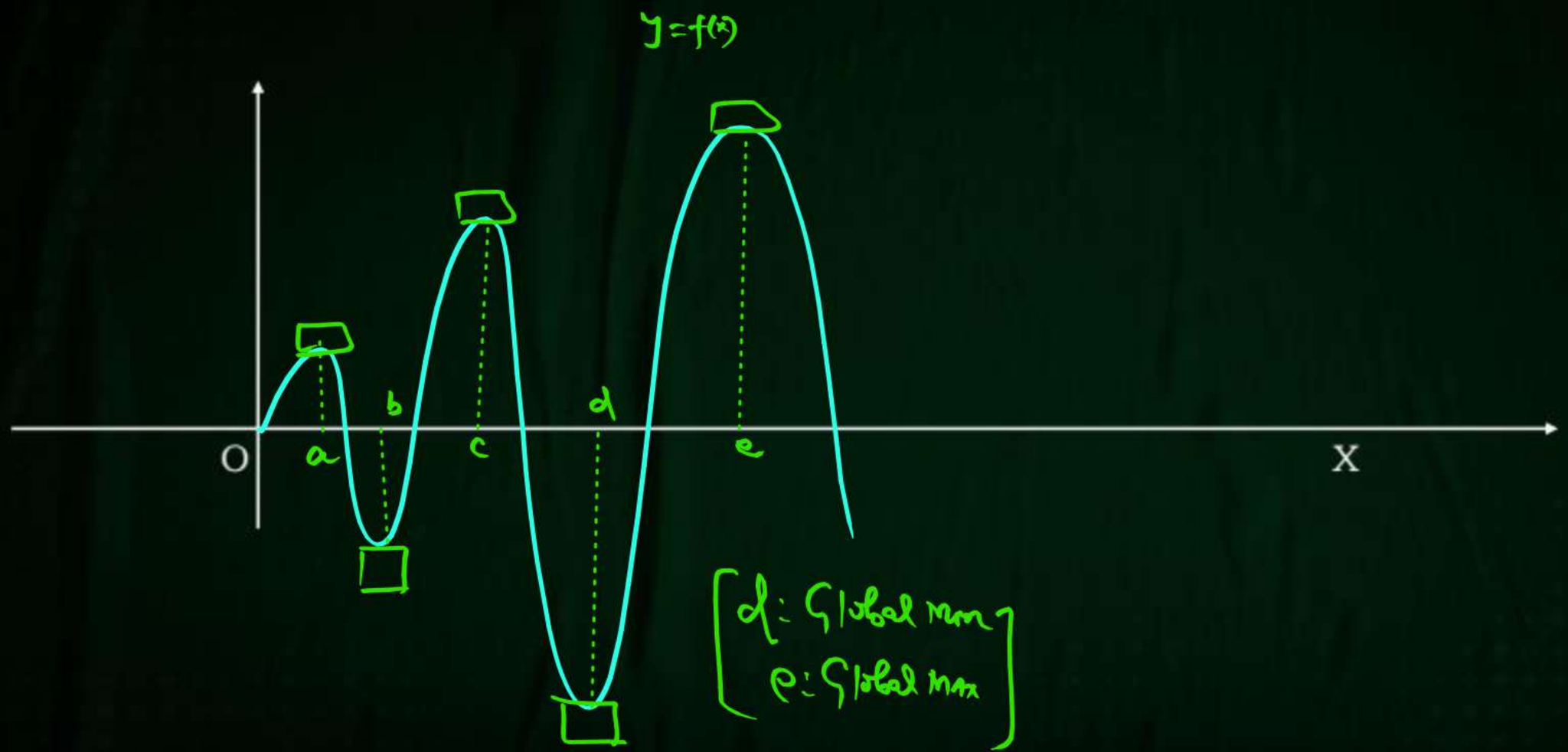
$\frac{1}{3}$





Absolute Maxima & Absolute Minima

Global max / Global min



[d : Global min
e : Global max]



Steps to Find out Global Max or Global Minima

Let we have a function $y = f(x)$ is defined in the defined domain

Step1: Find f'(x) $\frac{dy}{dx}$

Step 2: Find Critical Point(CP)

$f'(x) = 0$ $\quad \frac{dy}{dx} = 0$

↳ $x = x_1, x_2, x_3 \cdots$

Step 3:

→ **Find values of $f(x)$ at all the critical points**

$f(x_1) =$

$f(x_2) =$

⋮

$f(x_n) =$

Largest Value : A - max

least Value : A - min



Maxima and Minima in the Closed Interval [a,b]

Domain

Let we have a function $y = f(x)$ is defined in the defined domain [a, b]

Step1: Find f'(x) $\frac{dy}{dx}$

Step 2: Find Critical Point(CP)

$f'(x) = 0$ $\quad \frac{dy}{dx} = 0$

$x = x_1, x_2, x_3 \cdots \in [a,b]$

Step 3:

→ **Find values of $f(x)$ at all the critical points & End Points**

$f(x_1) =$
$f(x_2) =$
$\vdots$
$f(x_n) =$
$f(a) =$
$f(b) =$

→ largest value − A-max
→ least Value : A-Min

Question: CUET 2026 PYQs

The maximum value of the function $f(x) = 2x^3 - 24x + 5$ in the interval [0,4] is

A. 27
B. 5
C. −27
D. 37 ✓

$f'(x) = 6x^2 - 24$

C.P.

$6x^2 - 24 = 0$

$x^2 = 4$

$x = \pm 2$

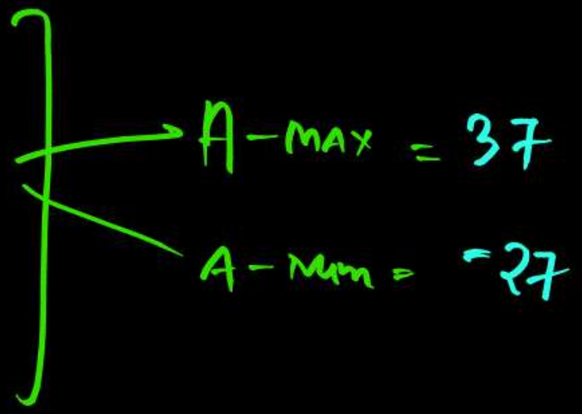
$x = 2 \in [0,4]$ ✓

$x = -2 \in [0,4]$ ✗

$f(4) =$

$f(1) =$

$f(4) =$



$f(4) = 16 - 48 + 5 \Rightarrow -27$

$f(1) = 5$

$f(4) = 128 - 96 + 5 = 37$

Question: CUET 2026 PYQs

Let $f(x)$ be a function defined by $f(x) = 2x^3 - 24x + 107$. If α and β are the maximum and minimum values respectively in the interval $[1, 3]$, then $\alpha - \beta$ is equal to:

A. 14
B. 24
C. 64
D. 89

$f'(x) = 6x^2 - 24$

CP:

$x = 2 \in [1,3]$

$x = -2 \notin [1,3]$

$f(x) =$
$f(1) =$
$f(3) =$

$f(3) = 16 - 48 + 107 = 75$

$f(1) = 2 - 24 + 107 = 85$

$f(3) = 54 - 72 + 107 = 89$

A-Max: $\alpha = 89$

A-Min: $\beta = 75$

$\alpha - \beta$

$= 89 - 75$

$= 14$

$161 - 72 = 89$

Question: CUET 2026 PYQs

For the function $f(x) = 2x^3 - 9x^2 + 12x - 5$, $x \in [0,3]$, which of the following statements are correct?

A. The point of absolute maxima is $x = 3$. ✗

B. The absolute minimum value is -1. ✗

C. The critical points are $x = 1$ and $x = 2$.

D. The absolute maximum value is 3.

Choose the correct answer from the options given below:

(A) A and B only ✗

(B) A, B and C only

(C) C and D only

(D) A and C only

$f'(x) = 6x^2 - 18x + 12$

$\Rightarrow 6[x^2 - 3x + 2]$

$\Rightarrow 6[(x-2)(x-1)]$

$f(0) = 16 - 36 + 24 - 5 \Rightarrow -1$

$f(1) = 2 - 9 + 12 - 5 \Rightarrow 0$

$f(0) = -5$

$f(3) = 3[18 - 27 + 12] - 5 \Rightarrow 4$

For CP

$x = 2 \in [0,3]$

$x = 1 \in [0,3]$

A-MAX : 4

A-M $\Rightarrow -5$

Check Calculation ↓ Comment ⇓

Question: CUET 2026 PYQs

At $x = 1$, the function $f(x) = x^4 - 48x^2 + \alpha x + 120$ attains its maximum value in the interval $[0, 2]$, then the value of α is:

A. 32
B. 92
C. 84
D. 64

$x = 1$: MAX

$f'(1) = 0$

$f'(x) = 4x^3 - 96x + a$

$f'(1) = 0$

$4 - 96 + a = 0$

$a = 92$

Question

C

For finding absolute maximum and minimum values of a function f given by $f(x) = 2x^3 - 15x^2 + 36x + 1$ on $[1,5]$.

A. the critical points in $(1,5)$ are 2 and 3.

B. the absolute maximum valne of f on $[1,5]$ is 29 .

C. the absolute minimum value of f on $[1,5]$ is 24.

D. the absolute minimum value of f on $[1,5]$ is 20 .

E. we evaluate the value of f at critical points and at the end points of the interval $[1,5]$.

H.W

Choose the correct answer from the options given below:

A A, C, E only

B D, E only

C B, C, D only

D C, D, E only

SSR SIR

Question

Let $a \leq \tan^{-1}x + \cot^{-1}x + \sin^{-1}x \leq b$. If α and β denote the minimum and maximum possible values of a and b respectively, then :

A $\alpha = 0, \beta = \pi$

B $\alpha = 0, \beta = \frac{\pi}{2}$

C $\alpha = \frac{\pi}{2}, \beta = \pi$

D $\alpha = -\frac{\pi}{2}, \beta = \frac{\pi}{2}$

$\left(\frac{\pi}{2} + \sin^{-1}x\right)$

RANGE ⇒ ?

$-\frac{\pi}{2} \leq \sin^{-1}x \leq \frac{\pi}{2}$

$0 \leq \frac{\pi}{2} + \sin^{-1}x \leq \pi$

a b

SSR SIR

Question – CUET 2025 PYQs

If a, b, c are positive real numbers, then the least value of $(a+b+c)(ab+bc+ca)$ is:

A. 1

B. abc

C. 9abc

D. 3abc

Let a, b, c are 3 +ve nos.

A.M ≥ G.M

$$\frac{a+b+c}{3} \geq (abc)^{1/3}$$

$$\boxed{(a+b+c) \geq 3(abc)^{1/3}} \quad -(1)$$

$a, b, c > 0$

A.M

$AM \Rightarrow \frac{a+b+c}{3}$ $\quad \{ G.M \Rightarrow (abc)^{1/3}$

AM ≥ G.M

Let $a, b, c > 0$

$ab, bc, ca > 0$

AM $\geq$ GM

$$\frac{ab+bc+ca}{3} \geq (ab \cdot bc \cdot ca)^{1/3}$$

$$ab+bc+ca \geq 3(a^2b^2c^2)^{1/3}$$

$$\boxed{ab+bc+ca \geq 3(abc)^{2/3}} \quad \sim (2)$$

$$(a+b+c)(ab+bc+ca) \geq 3(abc)^{1/3} \cdot 3(abc)^{2/3}$$

$$\geq 9(abc)^{\frac{1}{3}+\frac{2}{3}}$$

$$\geq 9(abc)$$

$$\boxed{(a+b+c)(ab+bc+ca) \geq 9(abc)}$$

$\Downarrow$

Least Value of

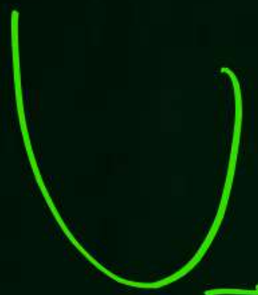
$$(a+b+c)(ab+bc+ca) = 9abc$$



Some Important Formulas

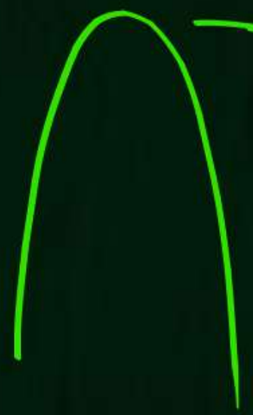
(1) $f(x) \Rightarrow \underbrace{ax^2+bx+c}_{\text{Q-Eqn}}$

$a>0$



→ Min Value = $-D/4a$

$a<0$



→ Max : $-D/4a$

(2) $-\sqrt{a^2+b^2} \le \pm a\sin x \pm b\cos x \le \sqrt{a^2+b^2}$

(3) $f(x) = \sin x \cdot \cos x \in \left[-\frac{1}{2}, \frac{1}{2}\right]$

$$f(x) = \frac{1}{2}\left[2\sin x \cos x\right]$$

$$= \frac{1}{2}\sin 2x$$

$$-1 \le \sin 2x \le 1$$

$$-\frac{1}{2} \le \frac{1}{2}\sin 2x \le \frac{1}{2}$$

Rate of Change.

① $\frac{dy}{dx} > 0 \Rightarrow$ fun ↑

$< 0 \Rightarrow$ fun ↑

② R.O.C → ↑ → $\frac{dy}{dx} > 0$

R.O.C → ↓ → $\frac{dy}{dx} < 0$

③ $R(x) \equiv$ Revenue fun

Marginal Revenue $= \frac{d[R(x)]}{dx}$

Area of Rectangle $\Rightarrow l * b$

Perimeter " " $\Rightarrow 2(l+b)$

Square — $A = a^2$, $P = 4a$

Cube — $V = a^3$, $SA = 6a^2$

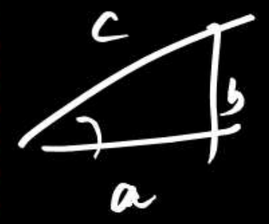


— $A = \frac{\sqrt{3}}{4}a^2$, $P = 3a$



$V = \frac{1}{3}\pi r^2 h$


Sphere: $V = \frac{4}{3}\pi R^3$, $SA = 4\pi R^2$



$c^2 = a^2 + b^2$

Question: CUET 2026 PYQs

The rate of change of volume of a sphere with respect to its surface area when its radius is 6 m, is

A. $5\ m^3/m^2$

B. $4\ m^3/m^2$

C. $3\ m^3/m^2$

D. $6\ m^3/m^2$

$V = \frac{4}{3}\pi R^3 \longrightarrow \frac{dv}{dR} = \frac{4}{3}(3\pi R^2)$

$S = 4\pi R^2 \longrightarrow \frac{ds}{dR} \Rightarrow 8\pi R$

$\frac{dv}{ds} = \frac{dv/dR}{ds/dR}$

$\Rightarrow \frac{4\pi R^3}{8\pi R} \Rightarrow \frac{6}{2} = 3$

Question: CUET 2026 PYQs

The ordinate of the point on the curve $y^2 = 8x$ for which abscissa and ordinate change at the same rate is:

A -2

B -4

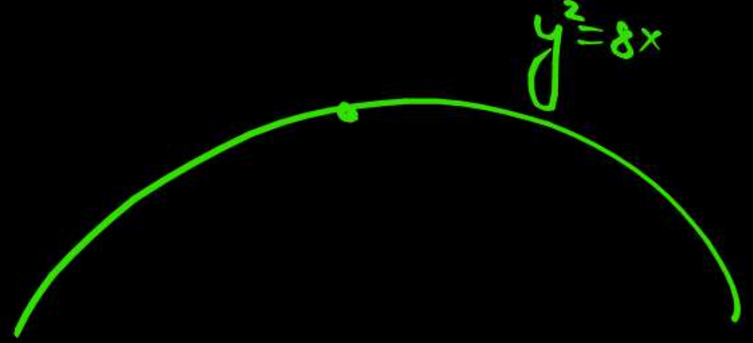
C 4

D 2

$y^2 = 8x$

$2y \cdot \frac{dy}{dt} = 8 \cdot \frac{dx}{dt}$

$y = 4$



$\left[\frac{dy}{dt} = \frac{dx}{dt}\right]$

$y = ?$

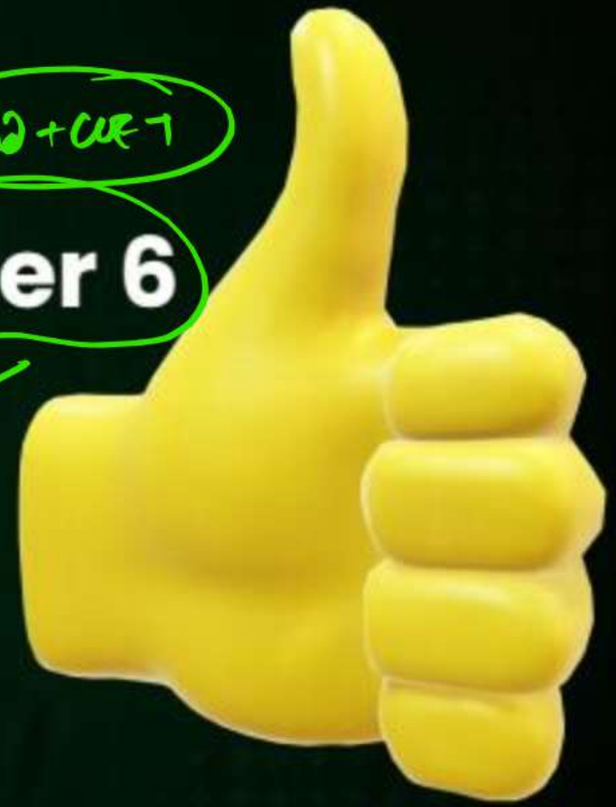
x = Abscissa

y = Ordinate



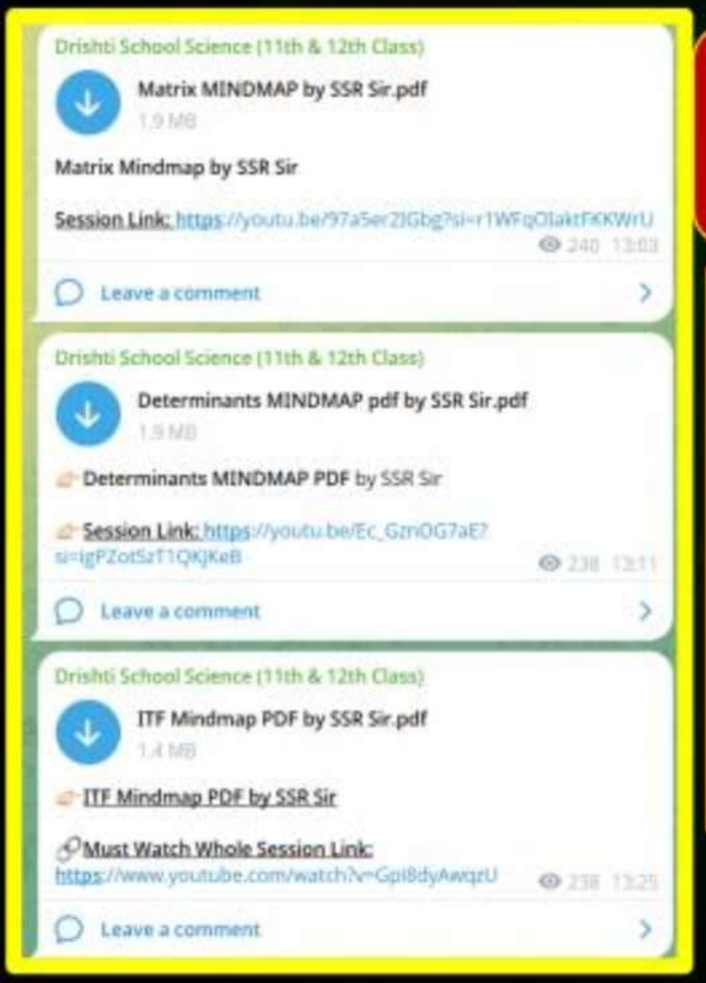
Home Work

- Complete NCERT Chapter 6
- Complete BPPT 5.0
- Mock Test

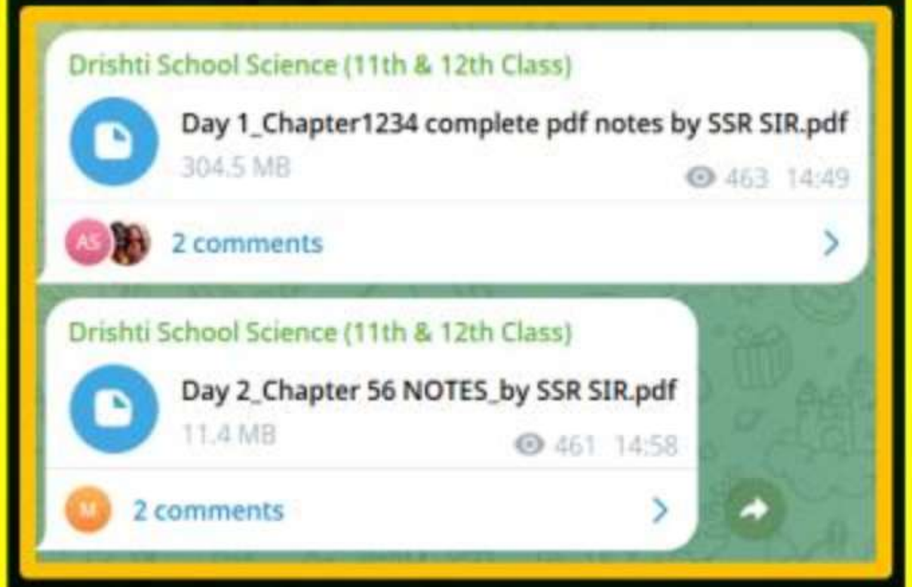


By- SSR Sir

For Class PDF, Guidence & Doubts Join Telegram Channel:



Telegram



@DRISHTI_CUET


Thank You
2026
PPT
Comment
Completed
May God Watch Over You !!
~ SHASHANK SINGH RAJPUT (SSR)