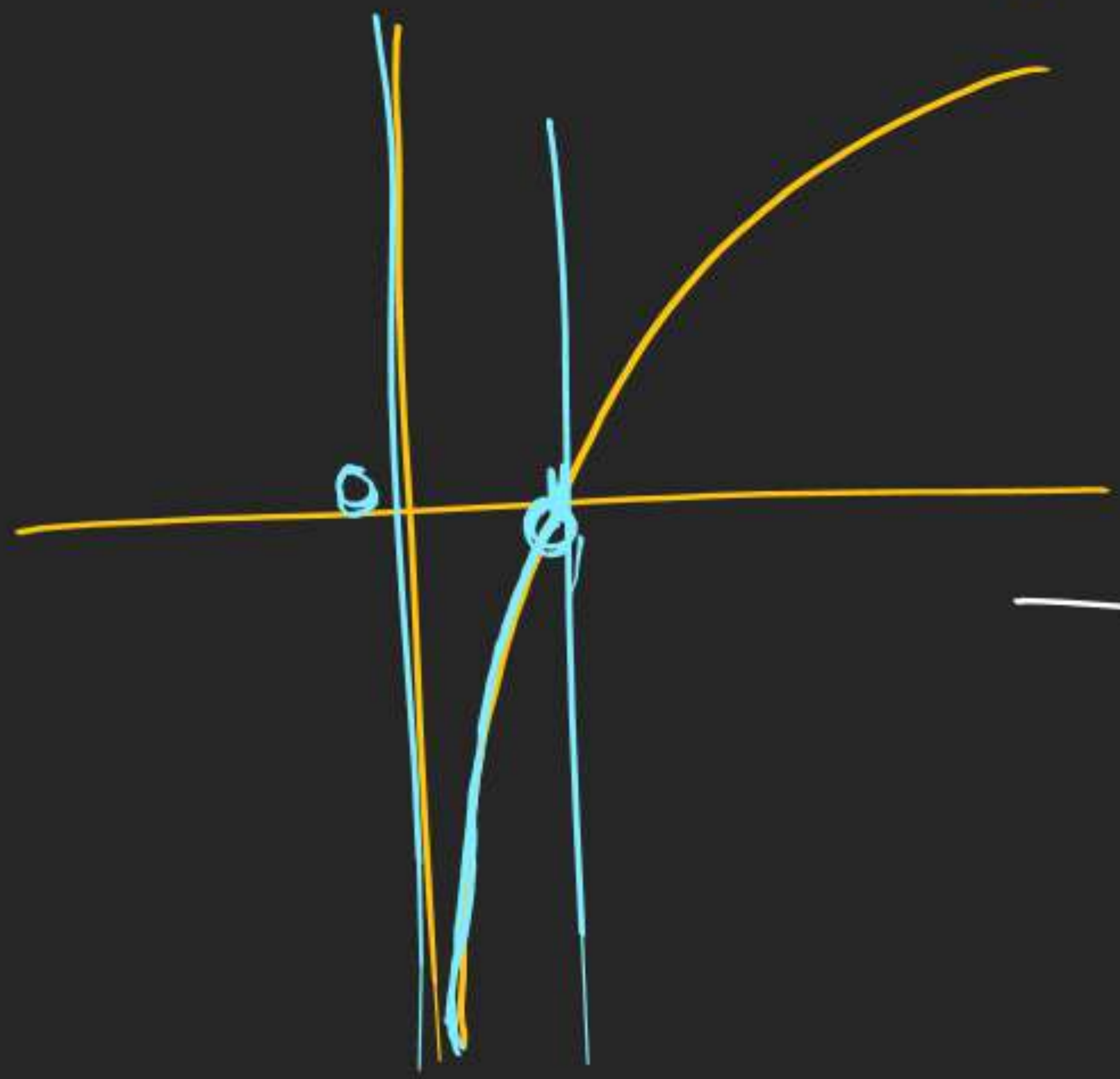
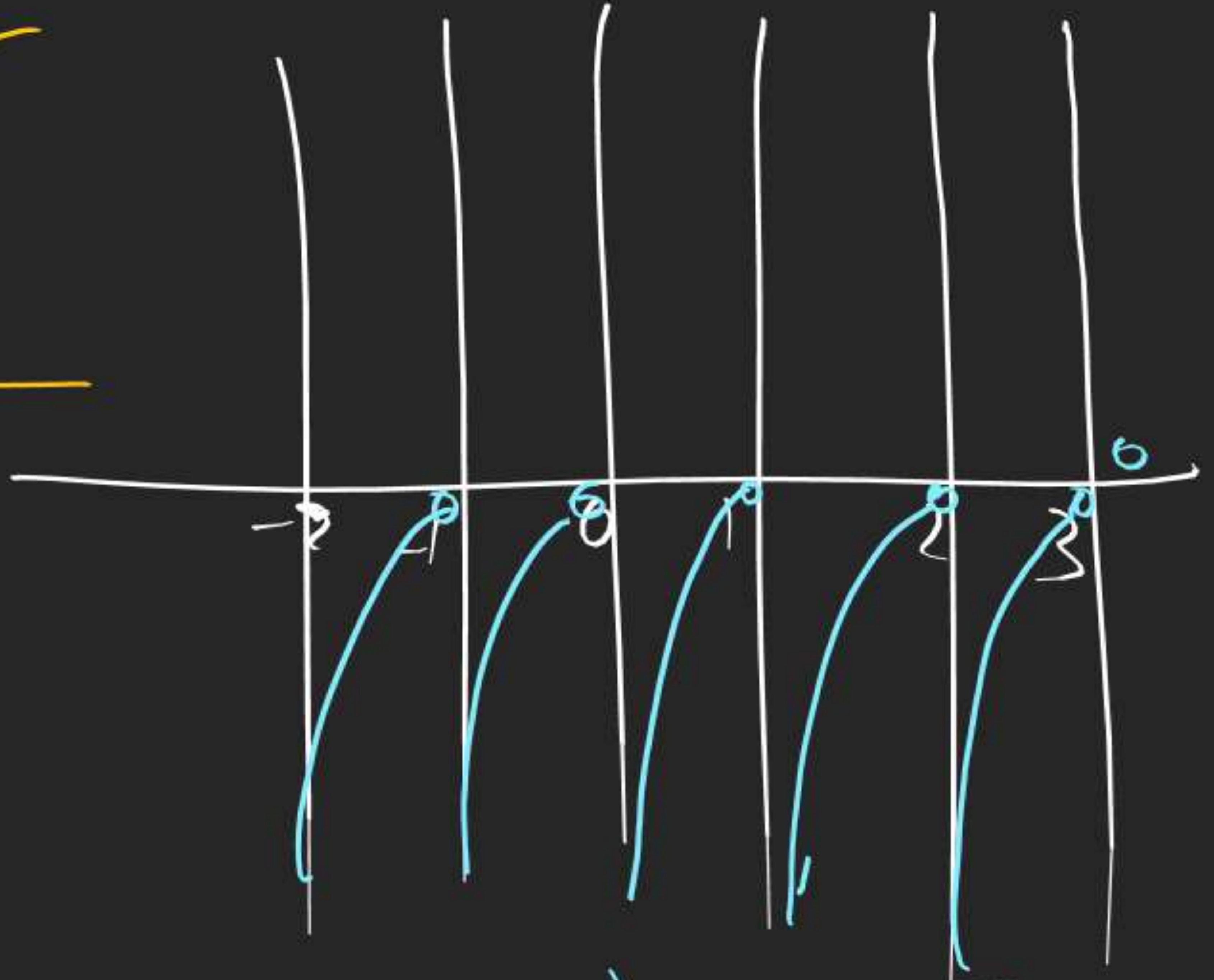
RELATION FUNCTION

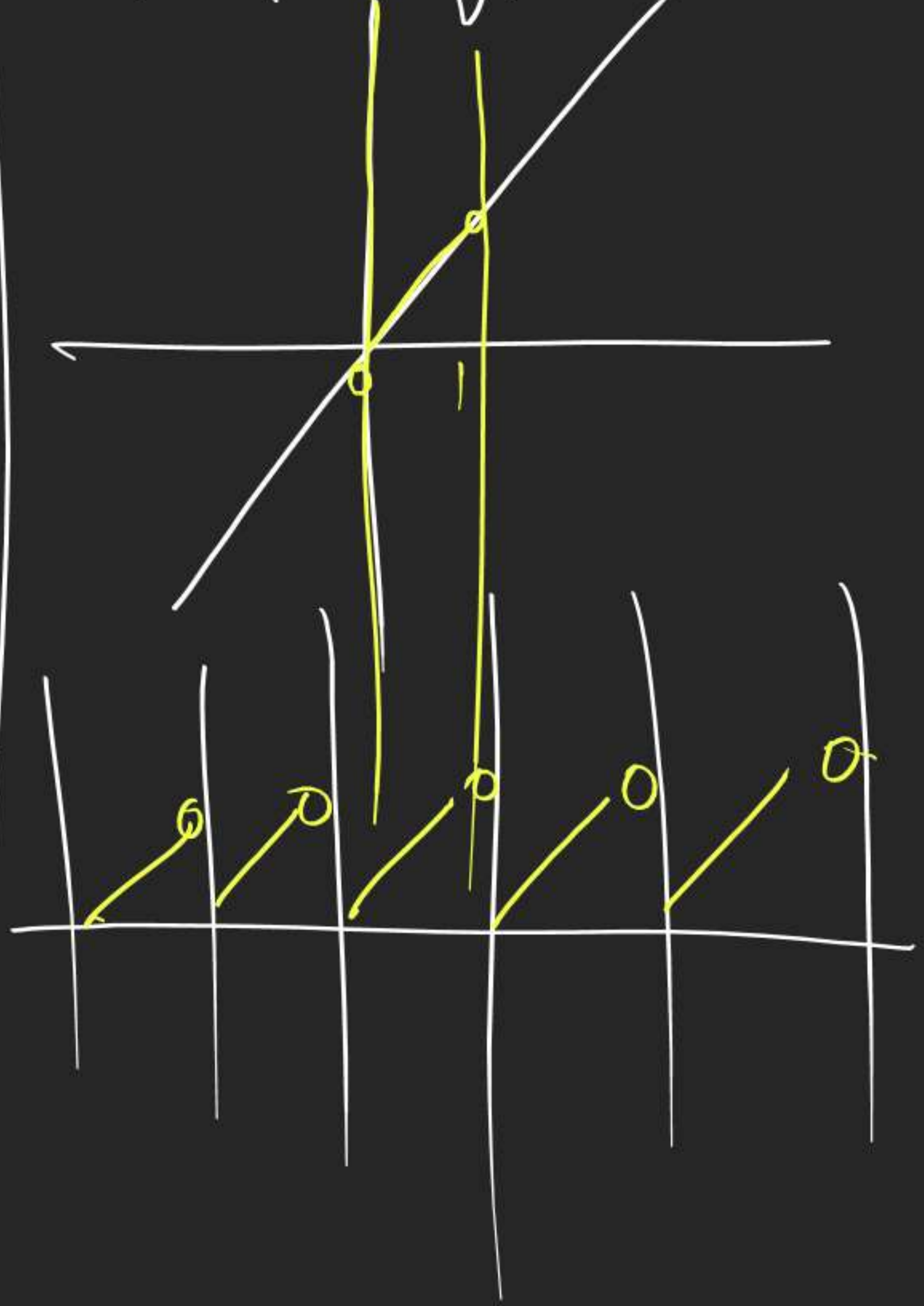
Q Graph of $y = \log\{x\}$





$Y \in (-\infty, 0)$

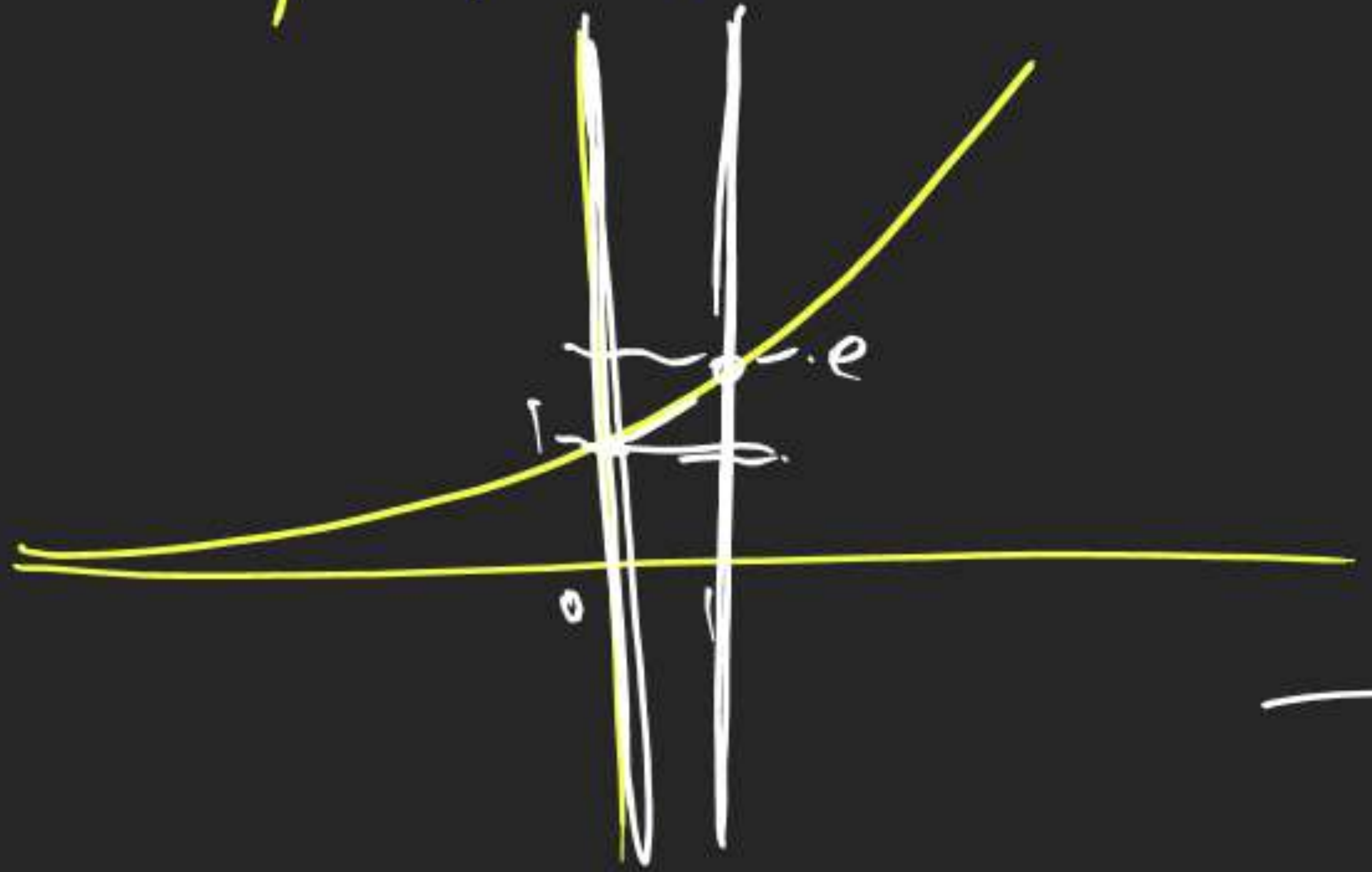
Graph of $y = \{x\}$

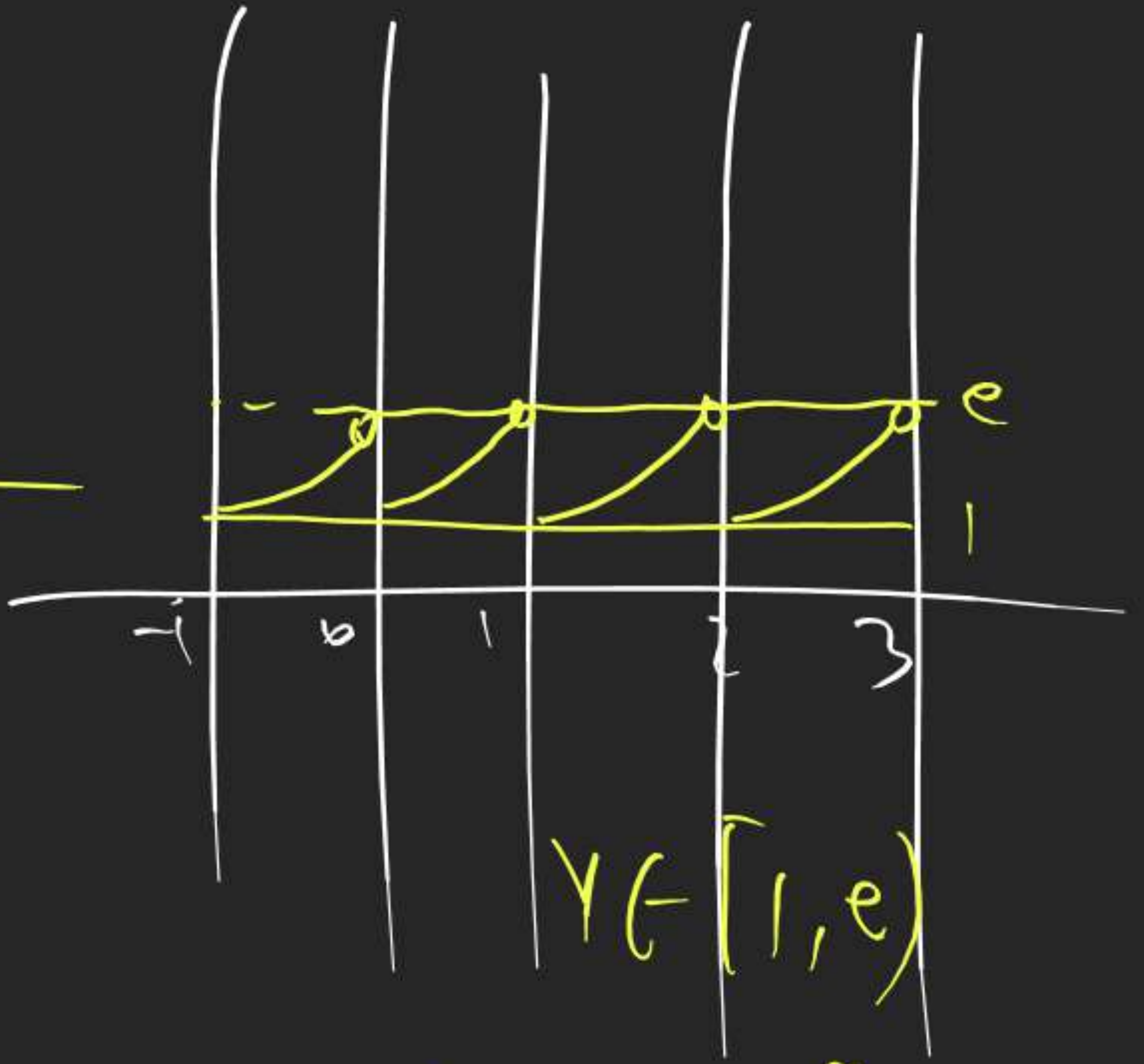


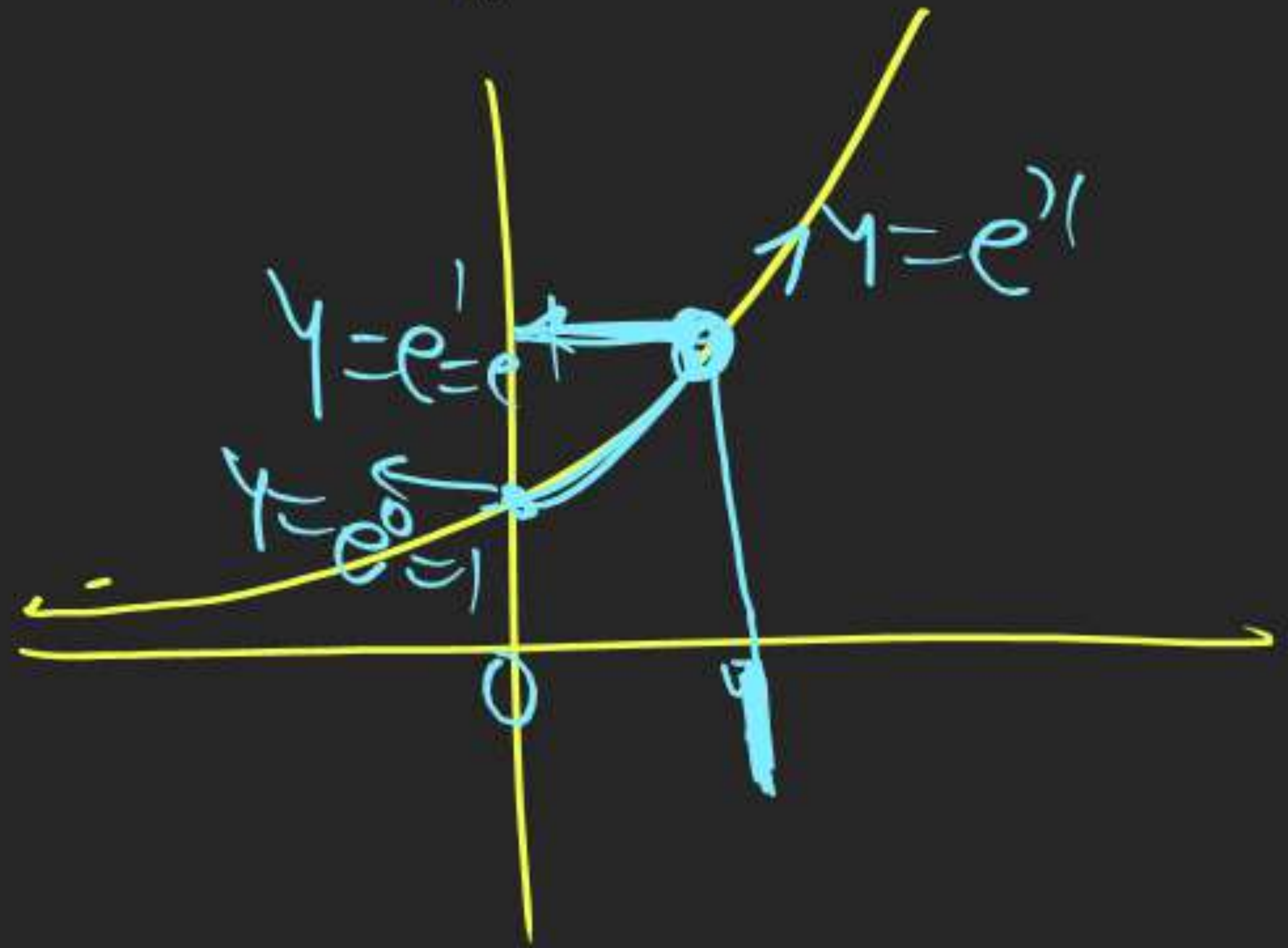
Nishant Jindal

RELATION FUNCTION

Q $y = e^{\{x\}}$







$y \in [1, e)$

$D_f \rightarrow x \in R$

RELATION FUNCTION

Q find Domain & Range of $y = \dfrac{x - [x]}{1 - [x] + x}$?

$$y = \frac{\{x\}}{1+\{x\}} = \{x\} \times \frac{1}{\{x\}+1}$$

$\{x\} \to R$ | $\{x\}+1 \neq 0$

$\boxed{\{x\} \neq -1}$

$x \in R$

$x \in R$

$$y = \frac{\{x\}}{1+\{x\}}$$

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

$$y = 1 - \frac{1}{1+\{x\}}$$

JJH SJJH

$$y = 1 - \frac{1}{1+\{x\}}$$

$$0 \le \{x\} < 1$$

$$1 \le 1 + \{x\} < 2$$

$$\frac{1}{1} \ge \frac{1}{1+\{x\}} > \frac{1}{2}$$

$$-1 \le \frac{-1}{1+\{x\}} < -\frac{1}{2}$$

$$0 \le 1 - \frac{1}{1+\{x\}} < \frac{1}{2}$$

$y \in [0, \frac{1}{2})$

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RELATION FUNCTION

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

$$0 \le \{x\} < 1$$

$$1 \le 1+\{x\} < 2$$

$$1 \ge \frac{1}{1+\{x\}} > \frac{1}{2}$$

$$-1 \le \frac{-1}{1+\{x\}} < \frac{-1}{2}$$

$$0 \le 1 - \frac{1}{1+\{x\}} < \frac{1}{2}$$

$$0 \le y < \frac{1}{2}$$

$$R_f \; y \in \left[0, \frac{1}{2}\right)$$

RELATION FUNCTION

x, $[x]$ & $\{x\}$ Based Qs

Q If $4\{x\} = x + [x]$ find $x = ?$

① Convert x into $\{x\} + [x]$

$$4\{x\} = \{x\} + [x] + [x]$$

$$3\{x\} = 2[x]$$

② find value of $\{x\}$ & put it in $[0,1)$

$$\boxed{\{x\} = \frac{2[x]}{3}} \Rightarrow 0 \leq \frac{2[x]}{3} < 1$$

$$0 \leq [x] < \frac{3}{2}$$

3) Read it & find $[x]$ then find $\{x\}$, then add them.

$$0 \leq [x] < \frac{3}{2}$$

$[x] = 0$	$[x] = 1$
$\{x\} = \frac{2 \times 0}{3} = 0$	$\{x\} = \frac{2 \times 1}{3} = \frac{2}{3}$
$x = 0$	$x = 1 + \frac{2}{3} = \frac{5}{3}$

$$x \in \left\{0, \frac{5}{3}\right\}$$

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RELATION FUNCTION

Q If $2x+3\{x\}=4[x]-2$ find x?

① $2\{x\}+2[x]+3\{x\}=4[x]-2$

$$5\{x\}=2[x]-2$$

$$\boxed{\{x\}=\frac{2([x]-1)}{5}}$$

② $$0\le \frac{2([x]-1)}{5}<1$$

$$0\le [x]-1<\frac{5}{2}$$

$$1\le [x]<\frac{7}{2}$$

$$1\le [x]<\frac{7}{2}$$

$[x]=1$	$[x]=2$	$[x]=3$
$\{x\}=\frac{2(1-1)}{5}$	$\{x\}=\frac{2(2-1)}{5}$	$\{x\}=\frac{2(3-1)}{5}$
$=0$	$=\frac{2}{5}$	$=\frac{4}{5}$
$x=1+0$	$x=2+\frac{2}{5}$	$x=3+\frac{4}{5}$
$=1$	$=\frac{12}{5}$	$=\frac{19}{5}$

$$x\in\left\{1,\frac{12}{5},\frac{19}{5}\right\}$$

Nishant Jindal

Adv

Q If $[x]\{x\}=1$ find sol. set?

$\{x\} = \frac{1}{[x]}$

$x - [x] = \frac{1}{[x]}$

$x = [x] + \frac{1}{[x]} > 2$

Sol set $= (2, \infty)$

$[x] \cdot \boxed{\{x\}} = 1$

$[0,1)$

$+$

+ve

+ve होगा पक्का

$\{x\} = \frac{1}{1} = 1$ ✗

$[x] = \frac{1}{[x]}$

$[x]^2 = 1$

$\cancel{[x] = 1}$

Nishant Jindal

Q No of sol. of eqn $e^{2x}+e^{x}-2=[\{x^2+10x+11\}]=?$

$[[0,1)]$

$=0$

0 1

$$e^{2x}+e^{x}-2=0$$

$$(e^{x})^2+e^{x}-2=0$$

$$(e^{x}+2)(e^{x}-1)=0$$

$$e^{x}=-2 \quad \& \quad e^{x}=1=e^{0}$$

$$x=0$$

$$x=\{0\}$$

Nishant Jindal

11) Signum fxn.

A) Rep by $y = \text{Sgn}(x)$

(B) $\text{Sgn}(x) = \begin{cases} \dfrac{|x|}{x} & x \neq 0 \\ 0 & x = 0 \end{cases}$

Defined fxn

$x \neq 0 \to x > 0$, $x < 0$

$\text{Sgn}(x) = \begin{cases} \dfrac{\cancel{x}}{\cancel{x}} = 1 & x > 0 \\ -\dfrac{\cancel{x}}{\cancel{x}} = -1 & x < 0 \\ 0 & x = 0 \end{cases}$

$$\boxed{y = \text{Sgn}(x) = \begin{cases} 1 & x > 0 \\ -1 & x < 0 \\ 0 & x = 0 \end{cases}}$$

$\text{Sgn}(\underset{\oplus}{3}) = 1$

$\text{Sgn}(\underset{-ve}{-1.8}) = -1$

$\text{Sgn}(0) = 0$

Nishant Jindal

Q $y = \text{Sgn}\{x\}$ Range ? = Answer

$= \text{Sgn}[0,1)$

$\oplus$

$= \text{Sgn}\, 0,\ \text{Sgn}\,(0,1)$

$R_f = y = \{0, 1\}$

$y = \text{Sgn}\,x = \begin{cases} 1 & x > 0 \\ 0 & x = 0 \\ -1 & x < 0 \end{cases}$

$D_f \to x \in R$

$R_f \to \{-1, 0, 1\}$

Nishant Jindal

Q $Y = \mathrm{Sgn}(\underline{e^x})$ find R_f?

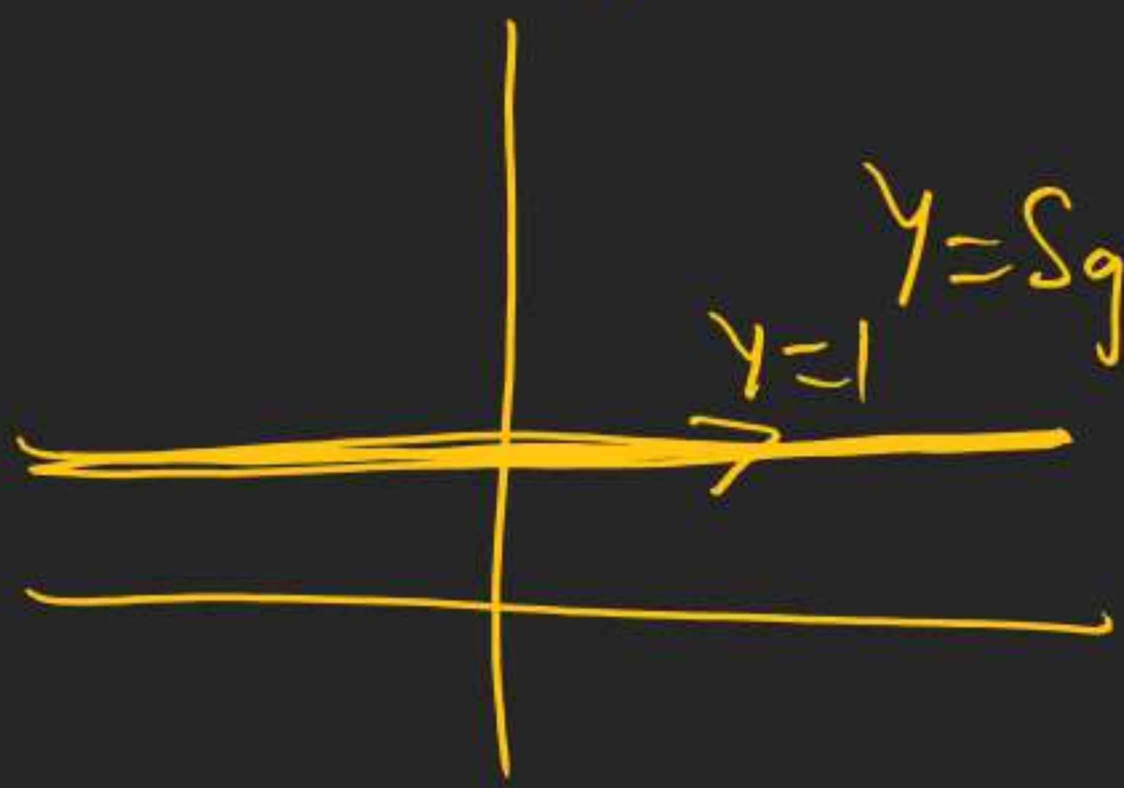
$e^x > 0$

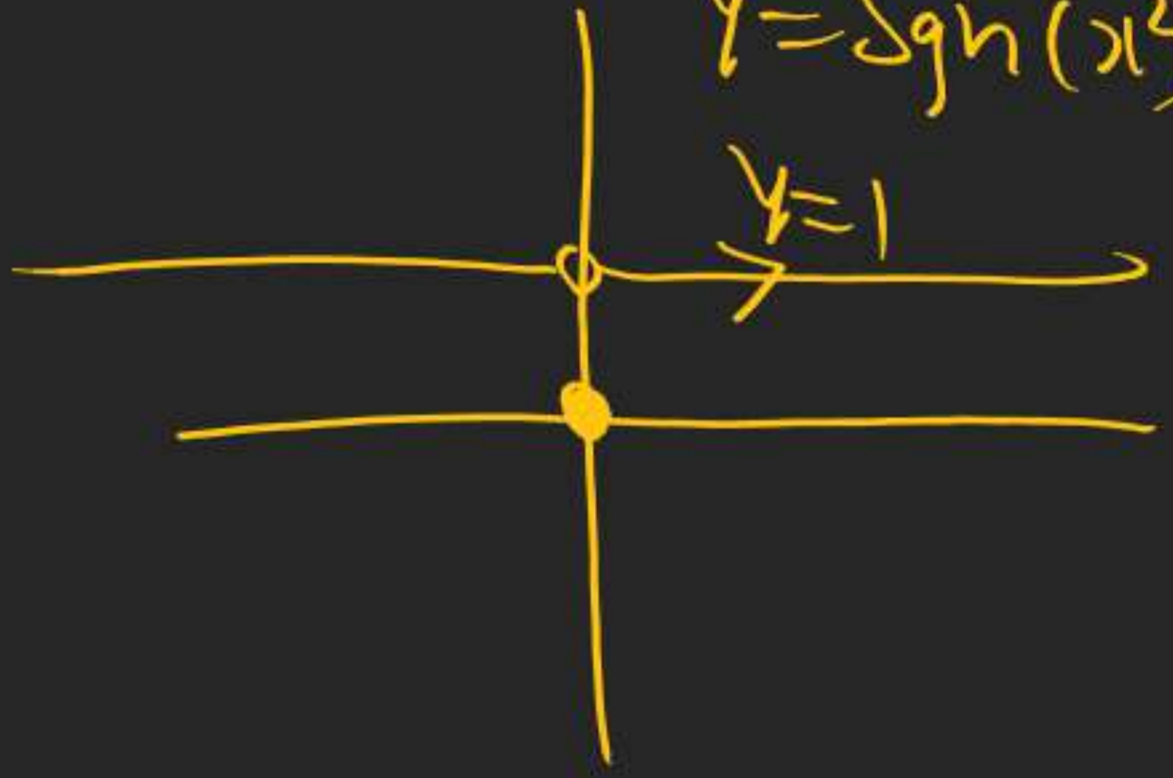
$e^x \in (0, \infty)$

$Y = \mathrm{Sgn}\,(0, \infty)$

$+$

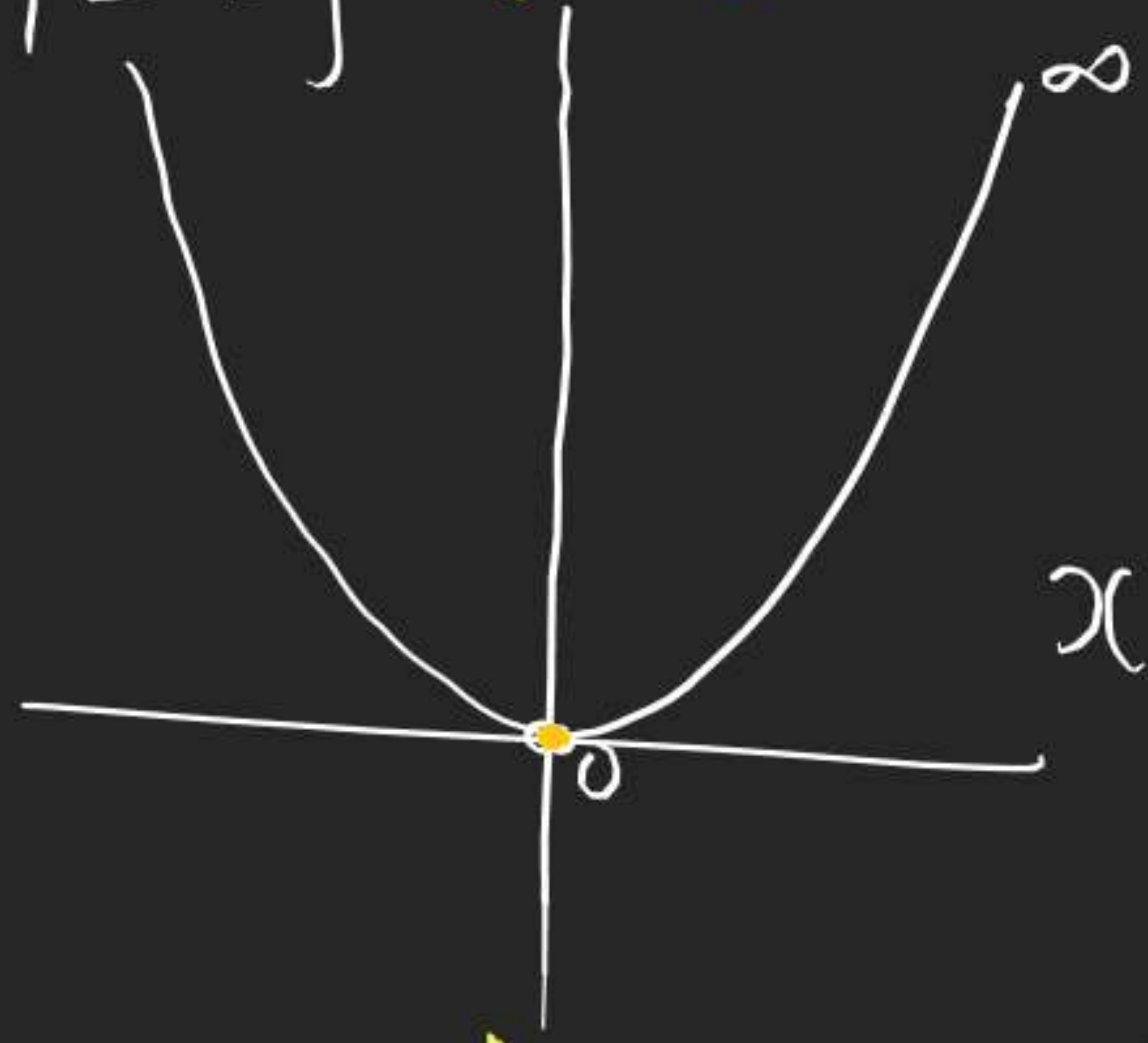
$\boxed{Y = 1}$ $\therefore R_f$ $\boxed{Y \in \{1\}}$



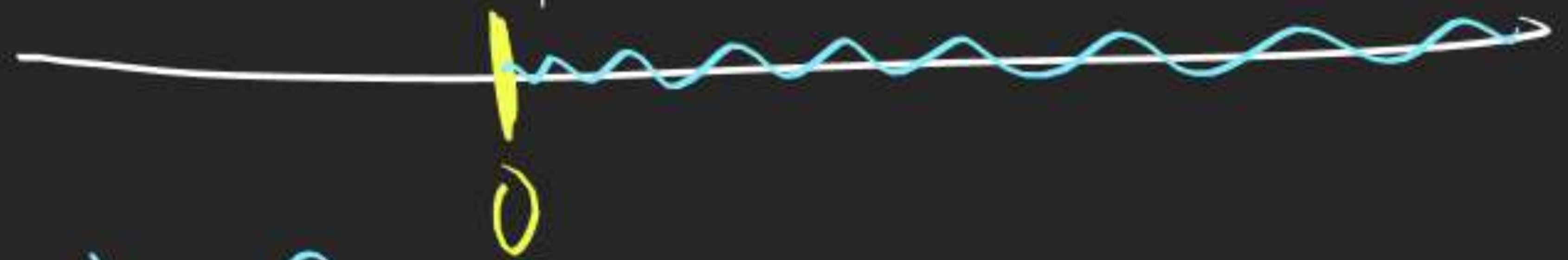


$x^2 \in [0, \infty)$

$Y = \mathrm{Sgn}\,(x^2)$



$x^2 \in [0, \infty)$



$Y = \mathrm{Sgn}[0, \infty)$

$= \mathrm{Sgn}\,0,\ \mathrm{Sgn}\,(0, \infty)$ $+$

$= 0, 1$

$\therefore R_f \in \{0, 1\}$

RELATION FUNCTION

17Qs , DPP1

Basic + SrDrd

Tough / Adv

3, 10, 12, 15, 16

Q17 Domain

(1) $f(x) = \dfrac{x^3 - 5x + 3}{x^2 - 1} = x^3 - 5x + 3 \times \dfrac{1}{x^2 - 1}$

Poly

$x \in R$

$x^2 - 1 \neq 0$

$x^2 \neq 1$

$x \neq \pm 1$

$x \in R - \{-1, 1\}$

$x \in R - \{-1, 1\}$

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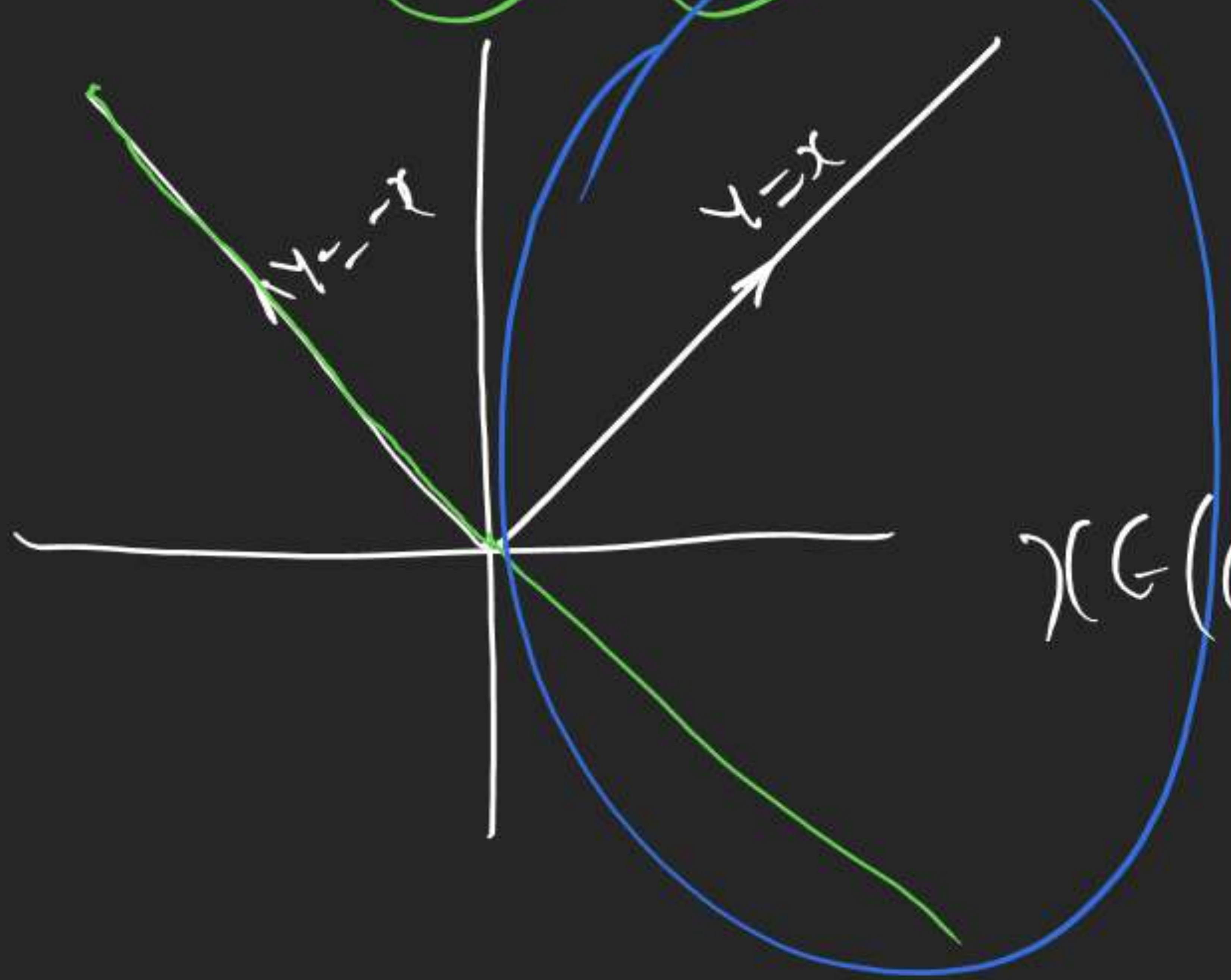
Q(ii) $y = \dfrac{1}{\sqrt{x+|x|}}$ Mains

$|x| + x > 0$

$|x| > -x$



$x \in (0, \infty)$

(iii) $y = e^{\underbrace{x+\sin x}}$ का D_f

Constant

$x \in R$

$x + \sin x$ का D_f

$R \cap R$

$x \in R$

Nishant Jindal

$$\frac{1}{\log_a b} = \log_b a$$

(iv) $y = \dfrac{1}{\log_{10}(1-x)} + \sqrt{x+2}$

$= \log_{(1-x)} 10 + \sqrt{x+2}$

$1-x>0 \Rightarrow x<1$

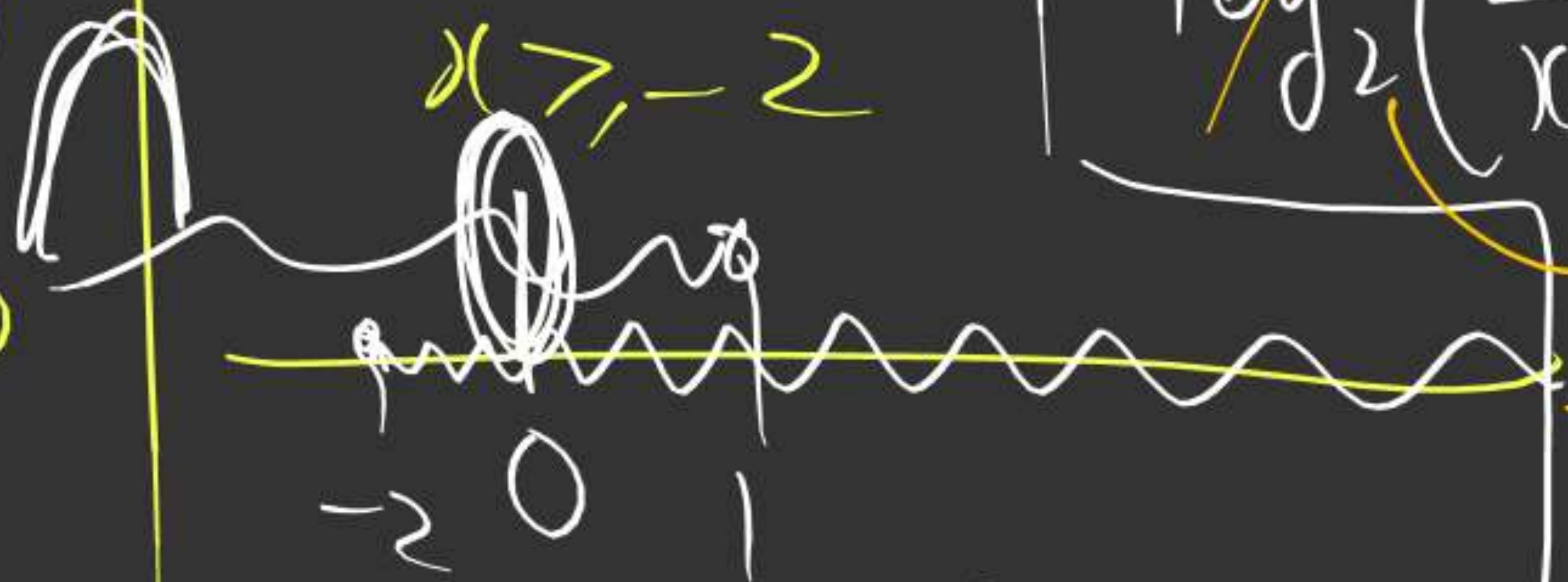
$1-x \neq 1 \Rightarrow x \neq 0$

$10>0$ ✓

$x \in (-\infty, 1) - \{0\}$

$x+2 \geq 0$

$x \geq -2$



$x \in (-2, 1) - \{0\}$

(v) $y = \log_x\left(\log_2\left(\dfrac{1}{x-1/2}\right)\right)$

$\dfrac{+}{+} = +$

$x>0$

$x \neq 1$

$\log_2\left(\dfrac{1}{x-1/2}\right) > 0$

$\dfrac{1}{x-1/2} > 1$

$2>0$

$2 \neq 1$

$\dfrac{1}{x-1/2} - 1 > 0$

$\dfrac{1-(x-1/2)}{(x-1/2)} > 0$

Solve

RELATION FUNCTION

(VI) $y = \sqrt{3 - 2^x - 2^{1-x}}$

$$3 - 2^x - \frac{2}{2^x} \geq 0$$

$$3 \cdot 2^x - (2^x)^2 - 2 \geq 0$$

$$3t - t^2 - 2 \geq 0$$

$$t^2 - 3t + 2 \leq 0$$

$$(t-1)(t-2) \leq 0$$

$$1 \leq t \leq 2$$

$$1 \leq 2^x \leq 2^1$$

$$2^0 \leq 2^x \leq 2^1$$

$$0 \leq x \leq 1$$

(VII) $y = \sqrt{1 - \sqrt{1 - x^2}}$

$$1 - \sqrt{1-x^2} \geq 0$$

$$1 \geq \sqrt{1 - x^2}$$

Sqr

$$1 \geq 1 - x^2$$

$$x^2 \geq 0$$

$$x \in R$$

$$1 - x^2 \geq 0$$

$$x^2 - 1 \leq 0$$

$$(x-1)(x+1) \leq 0$$

BHALA

$$-1 \leq x \leq 1$$

$\cap$

$$x \in [-1, 1]$$

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RELATION FUNCTION

होता है

$$\boxed{a^{3/2} = a\sqrt{a}}$$

(VIII) $y = (x^2+x+1)^{-3/2}$

$$= \frac{1}{(x^2+x+1)^{3/2}}$$

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

$x^2+x+1 \neq 0$

$D = -3$ +ve

$x \in R$

True for all x

$x^2+x+1 > 0$

$D = -3 \quad a = 1$

x^2+x+1 is +ve for all x

$\underline{x \in R}$

R

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RELATION FUNCTION

(IX) $y = \sqrt{\dfrac{x-2}{x+2}} + \sqrt{\dfrac{1-x}{1+x}}$

$\dfrac{(x-2)}{(x+2)} \geq 0$

+ − +

$-2 \quad 2$

$\dfrac{1-x}{1+x} \geq 0$

$\dfrac{(x-1)}{(x+1)} \leq 0$

+ − +

$-1 \quad +1$

$-2 \quad -1 \quad 1 \quad 2$ Common Korchh Nhi

$x \in \phi$

(X) $y = \sqrt{\tan x - \tan^2 x}$

$\tan x - \tan^2 x \geq 0$

$\Rightarrow \tan^2 x - \tan x \leq 0$

$\Rightarrow (\tan x)(\tan x - 1) \leq 0$

$0 \leq \tan x \leq 1$

$\tan 0 \leq \tan x \leq \tan \frac{\pi}{4}$

$0 \leq x \leq \frac{\pi}{4}$

Trigo

$x \in \left[n\pi + 0, n\pi + \frac{\pi}{4}\right]$

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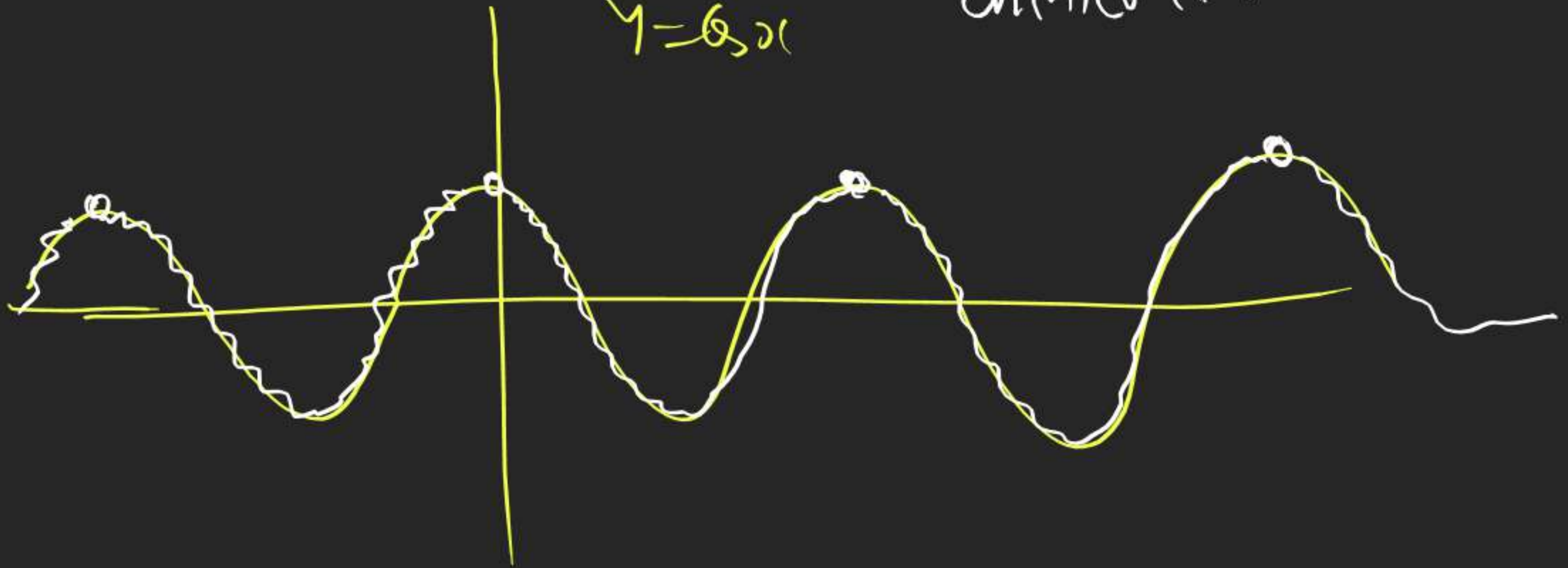
RELATION FUNCTION

11) $y = \dfrac{1}{\sqrt{1-\cos x}}$

$1 - \cos x > 0$

$\cos x < 1 \rightarrow \cos x$, 1 से कम वाली लेना है

$y = \cos x$



$\cos x \neq 1$

$x \neq 2n\pi$

$x \in R - \{2n\pi\}$

$\boxed{\begin{array}{l} \cos x = 1 \\ x = \text{even}\,\pi \\ x = 2n\pi \end{array}}$

12) $\rightarrow (0, 1] \cup [4, 5)$

13) $(2, 3)$

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RELATION FUNCTION

$\sin y = \sin x$ का Graph

$= n\pi + (-1)^n x$

$0\pi + (-1)^0 x \Rightarrow y = x$

$\pi + (-1)^1 x = \pi - x$

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

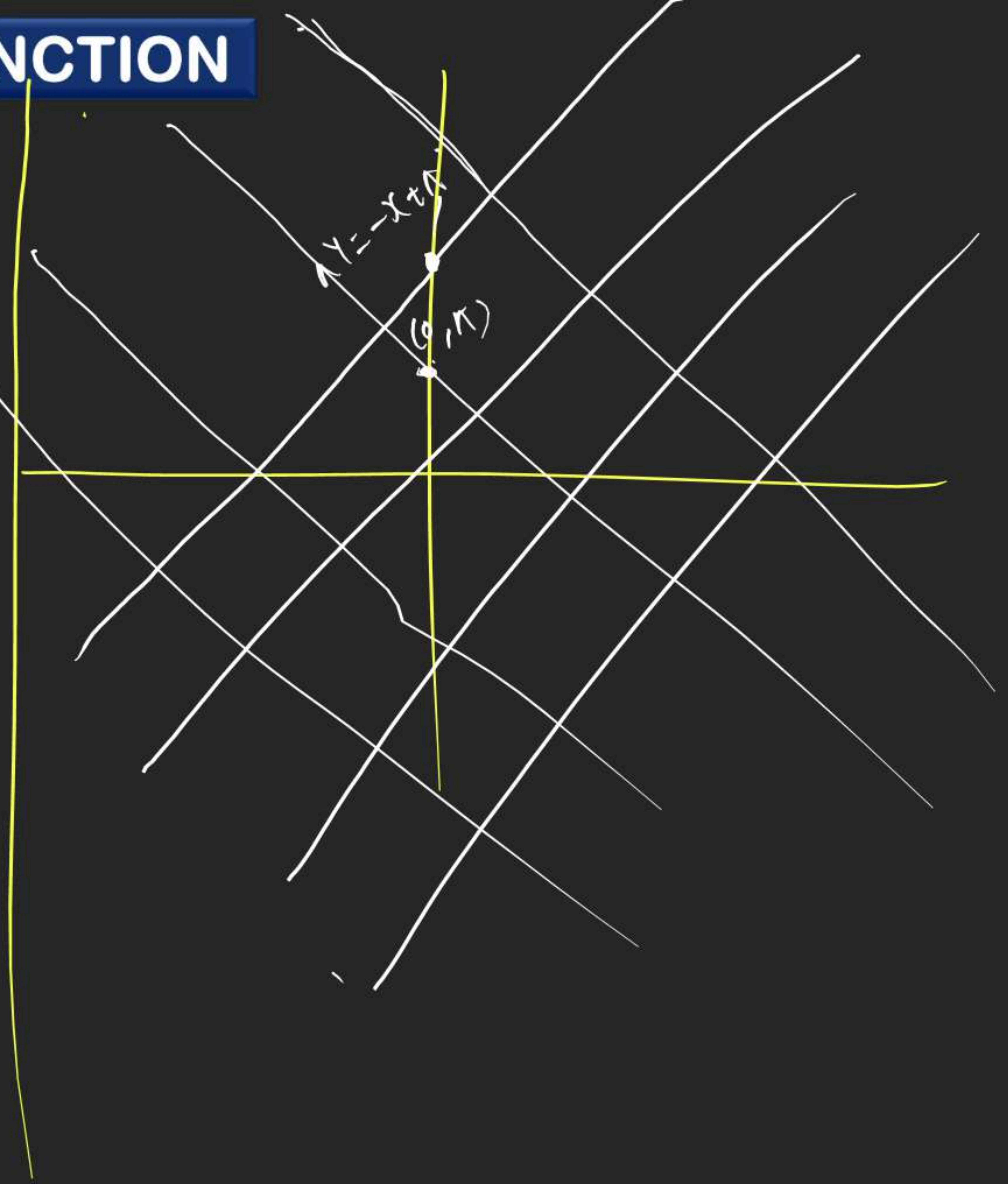
$= 3\pi - x$

(Trigo Eqn में पढ़ा था)
11th की copy निकालो
11th coaching के नोट्स
रट लेना।

$y = -x + \pi$

$y = x + 2\pi$

$y = -x + 8\pi$



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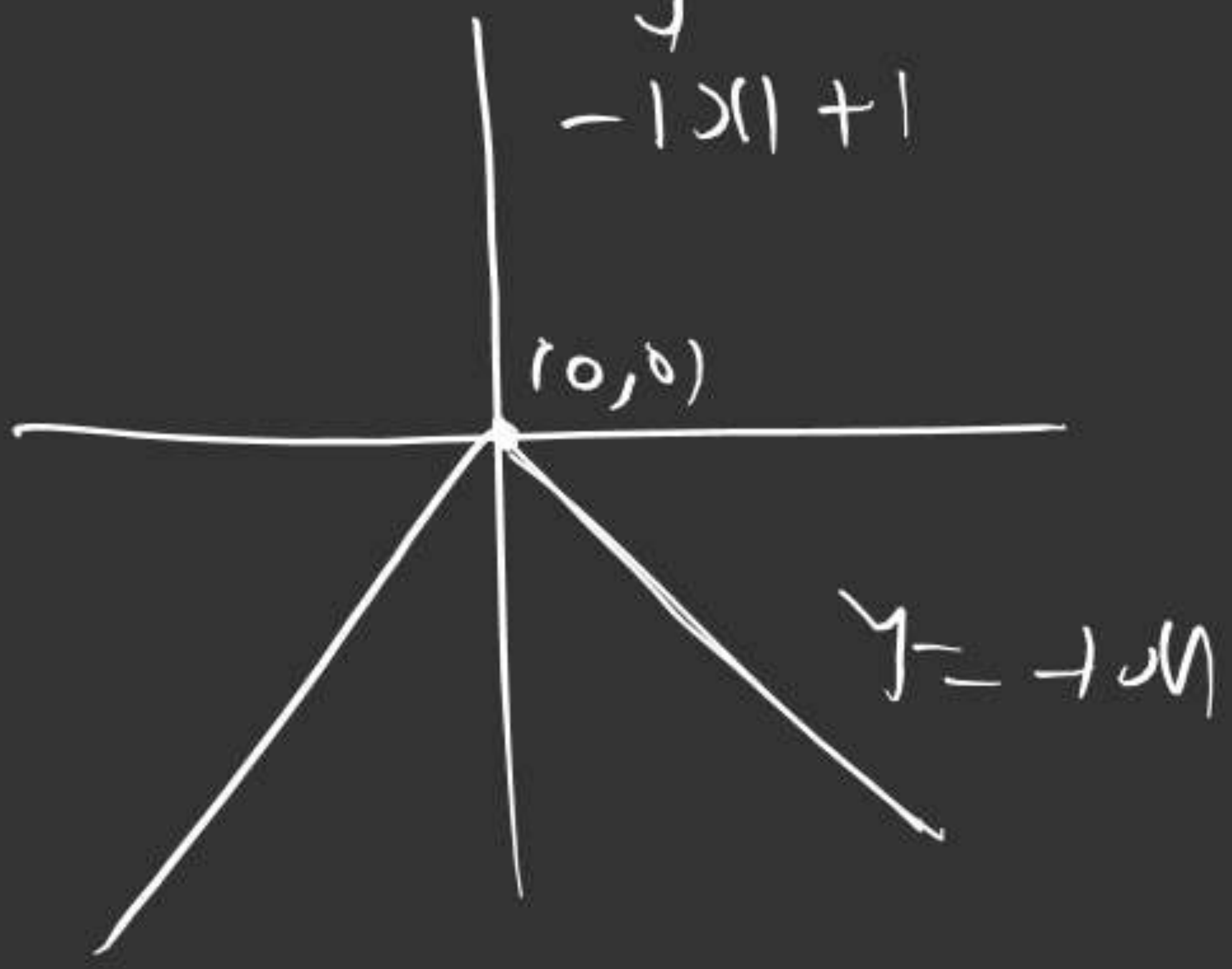
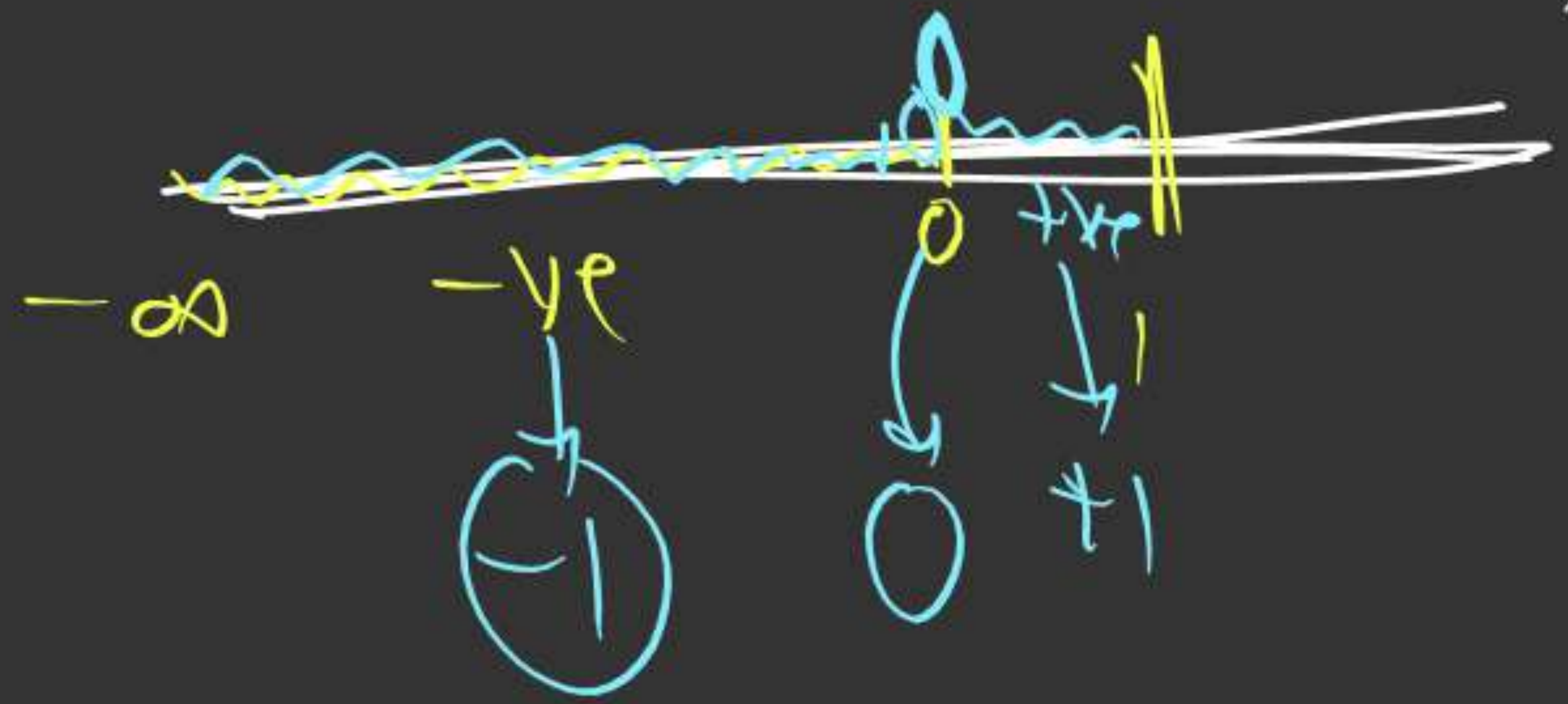
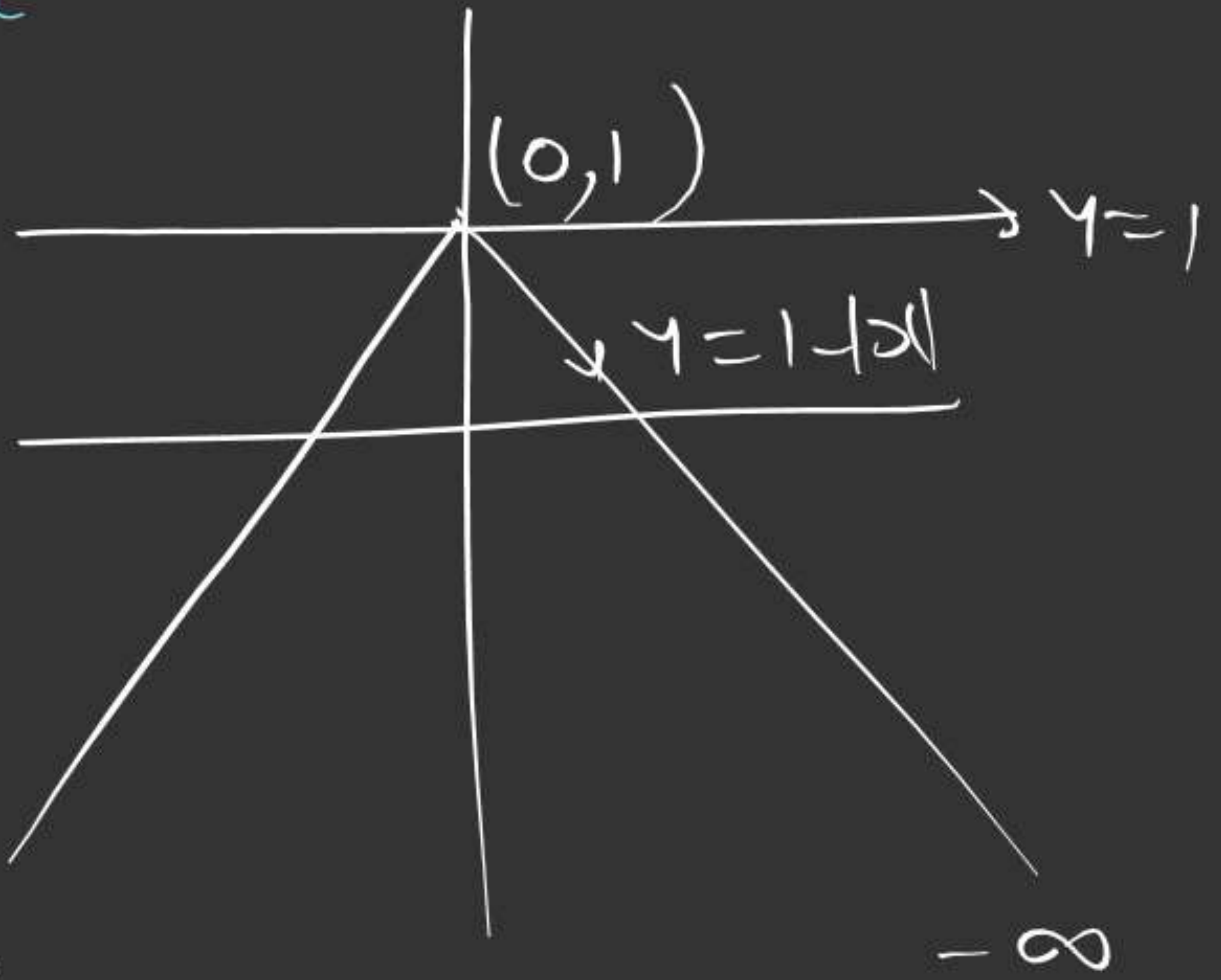
15) $y = \text{Sgn}(\underbrace{1-|x|}) = \{-1, 0, 1\}$

$(-\infty, 0), \{0\}, (0, 1]$







$R_f = (-\infty, 1] \rightarrow$ 3 Tokde.

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$$\frac{1}{\log_a b} = \log_b a$$

$$\frac{x^2 - 8x + 23}{8} < \cancel{0}$$

14) $$y = \log_e \left\{ \log_{|\sin x|}(x^2 - 8x + 23) - \frac{3}{\log_2 |\sin x|} \right\} \quad D_f$$

Doit

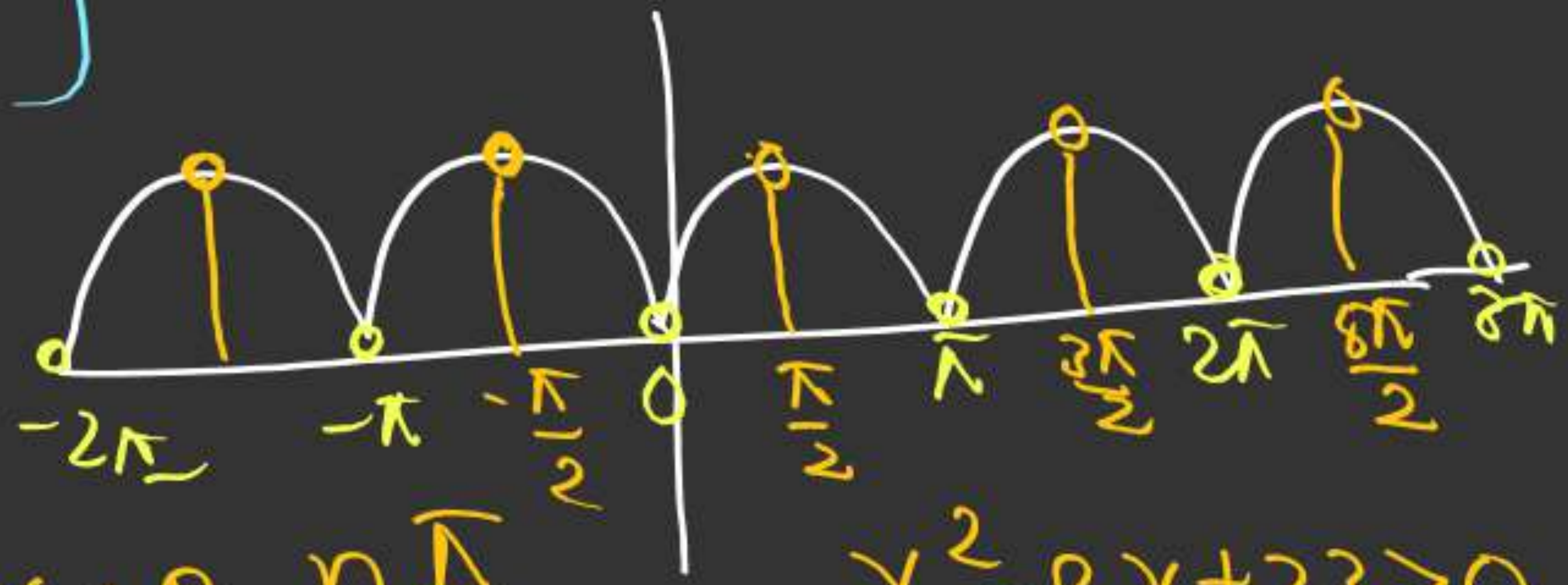
$$y = \log_e \left\{ \log_{|\sin x|}(\qquad) - 3 \log_{|\sin x|} 2^3 \right\}$$

$$\log_m A - \log_m B = \log \frac{A}{B}$$

Decfxn

$$= \log_e \left\{ \log_{|\sin x|} \frac{x^2 - 8x + 23}{8} \right\}$$

$y = |\sin x|$



$e > 0$

$e \neq 1$

$\cancel{\log}_{|\sin x|}$ Base $\in (0,1)$

$$\frac{x^2 - 8x + 23}{8} > 0$$

$|\sin x| > 0$

$|\sin x| \neq 1$

$$x \in R - n\frac{\pi}{2}$$

$$\frac{x^2 - 8x + 23}{8} > 0 \Rightarrow$$

$$x^2 - 8x + 23 > 0$$

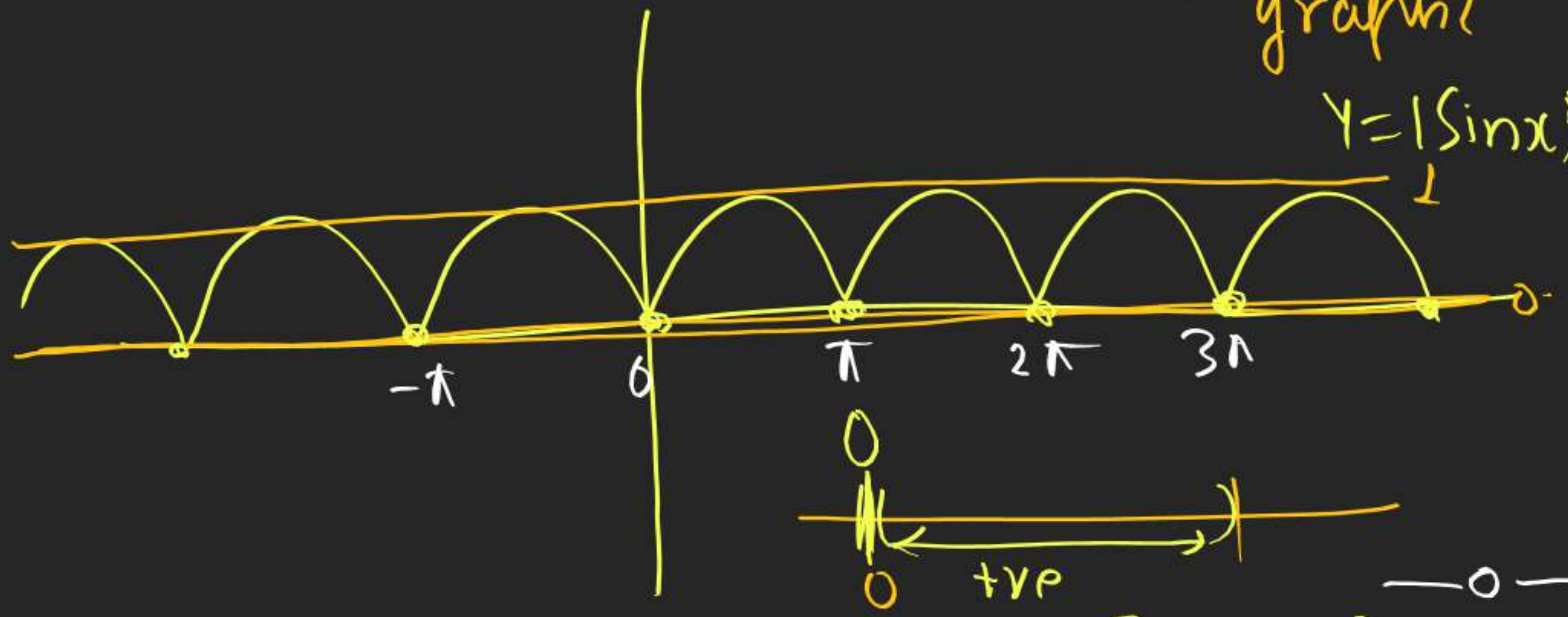
Nishant Jindal

RELATION FUNCTION

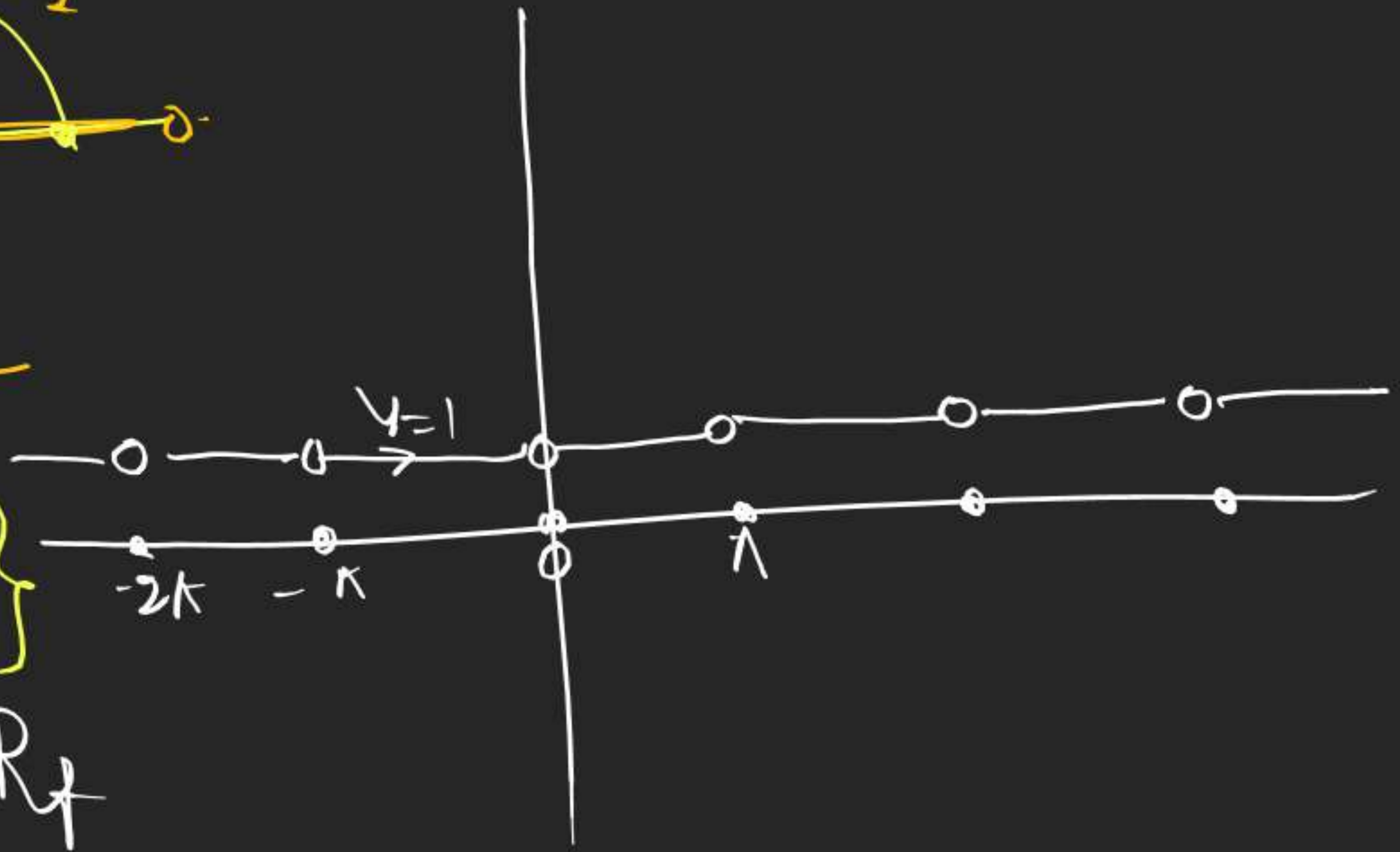
form → Note | Opp qs ← Backward

Q $Y = \mathrm{Sgn}(|\sin x|)$ find Range & make graph?

$Y = |\sin x| \in [0, 1]$



$Y = \mathrm{Sgn}(|\sin x|) = \{0, 1\}$ ← R_f



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RELATION FUNCTION

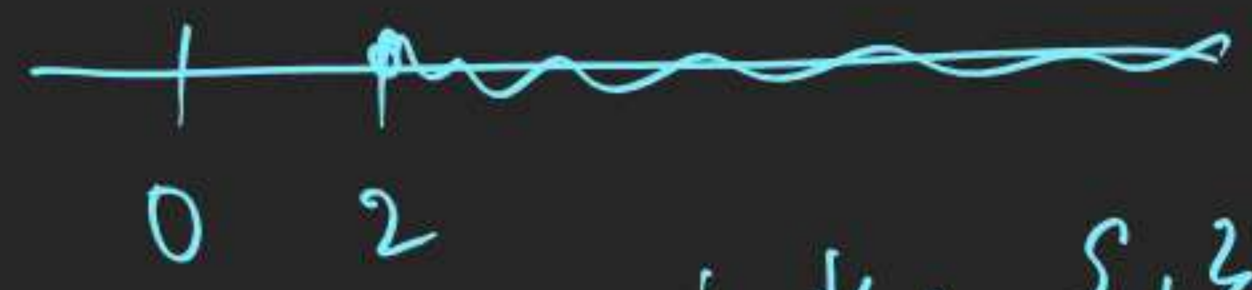
Q $y = \operatorname{Sgn}(x^2 - 2x + 3)$ R_f ?

$$\left((x^2 - 2x + 1) + 2\right)$$

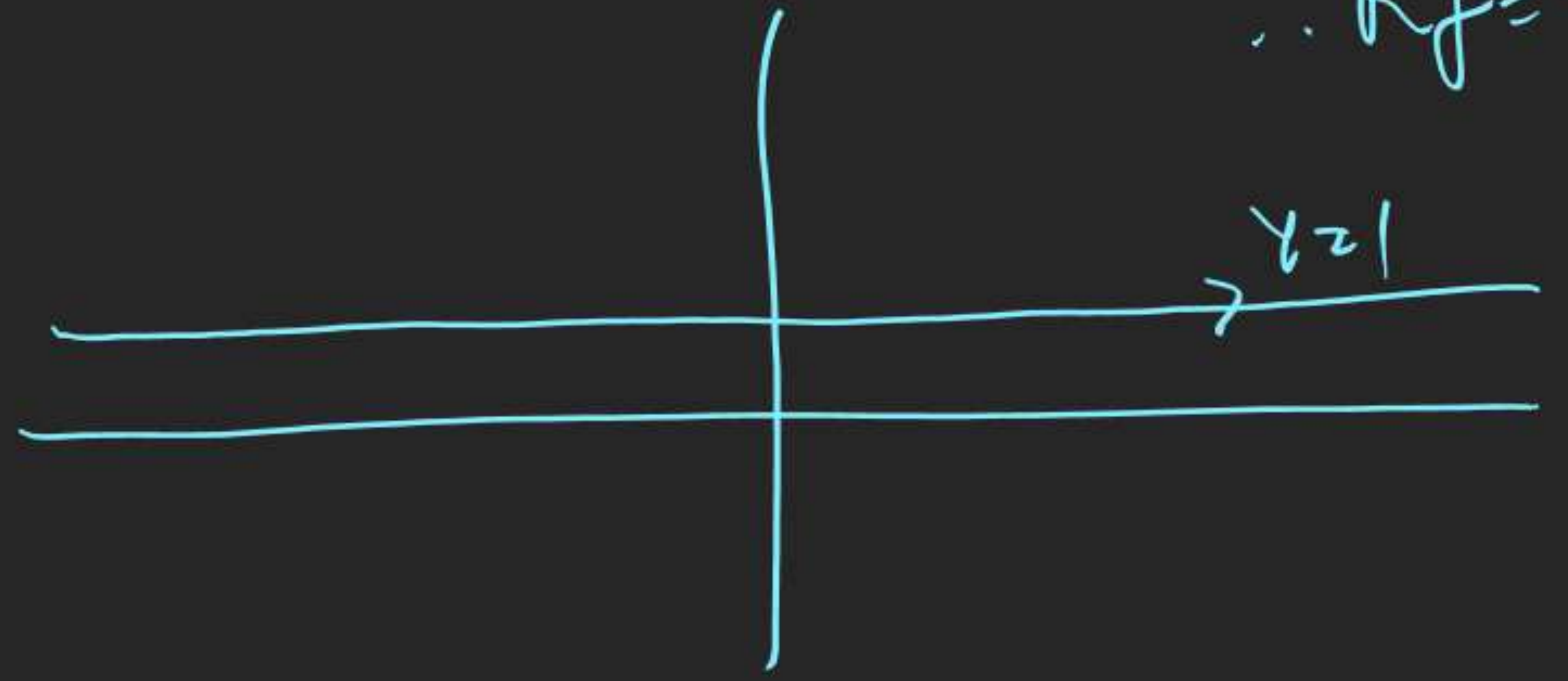
$$y = \operatorname{Sgn}\left(\underbrace{(x-1)^2 + 2}_{\geq 0 + 2}\right) = 1 \quad \text{Ans.}$$

$\geq 0 + 2$ → +ve {DT}

≥ 2



$\therefore R_f = \{1\}$



M2

$a = 1,\ b = -1,\ c = 3.$

$D = (-1)^2 - 4 \times 1 \times 3$

$= -11 = -ve$

$a > 0,\ D < 0$

$x^2 - 2x + 3 > 0$ for all x

$y = \operatorname{Sgn}(x^2 - 2x + 3) = 1.$

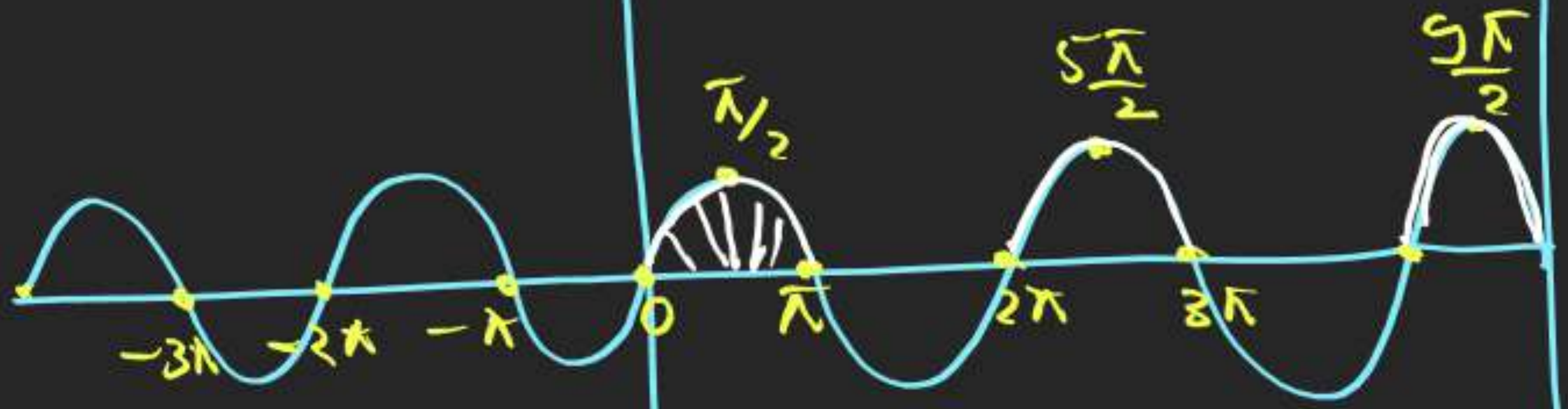
Nishant Jindal

RELATION FUNCTION

$(2n\pi, (2n+1)\pi)$

Trig of xn.

① $y = \sin x$



A) $\sin x = 0$

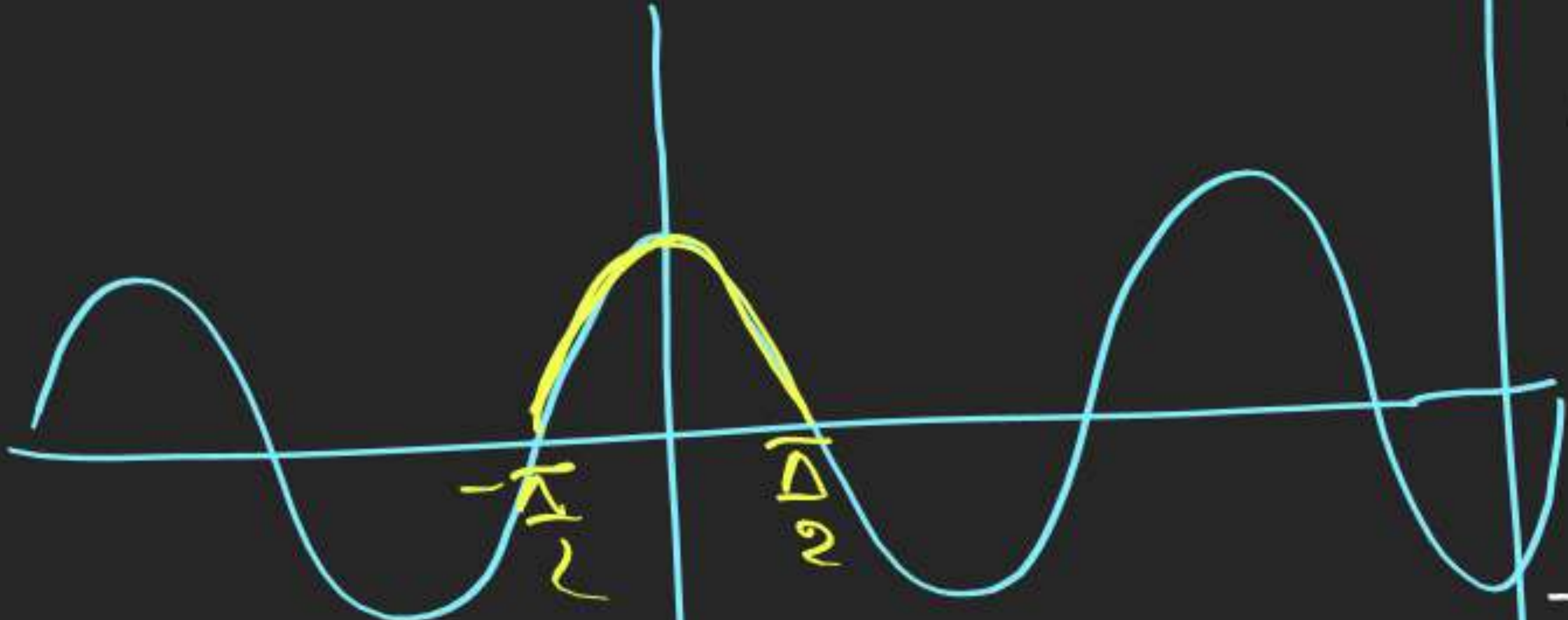
$x = n\pi$

B) $\sin x = 1 \Rightarrow x = (4n+1)\frac{\pi}{2}$

C) $\sin x > 0$ कहाँ?

$0 < x < \pi \Rightarrow x \in (2n\pi + 0, 2n\pi + \pi)$

② $y = \cos x$



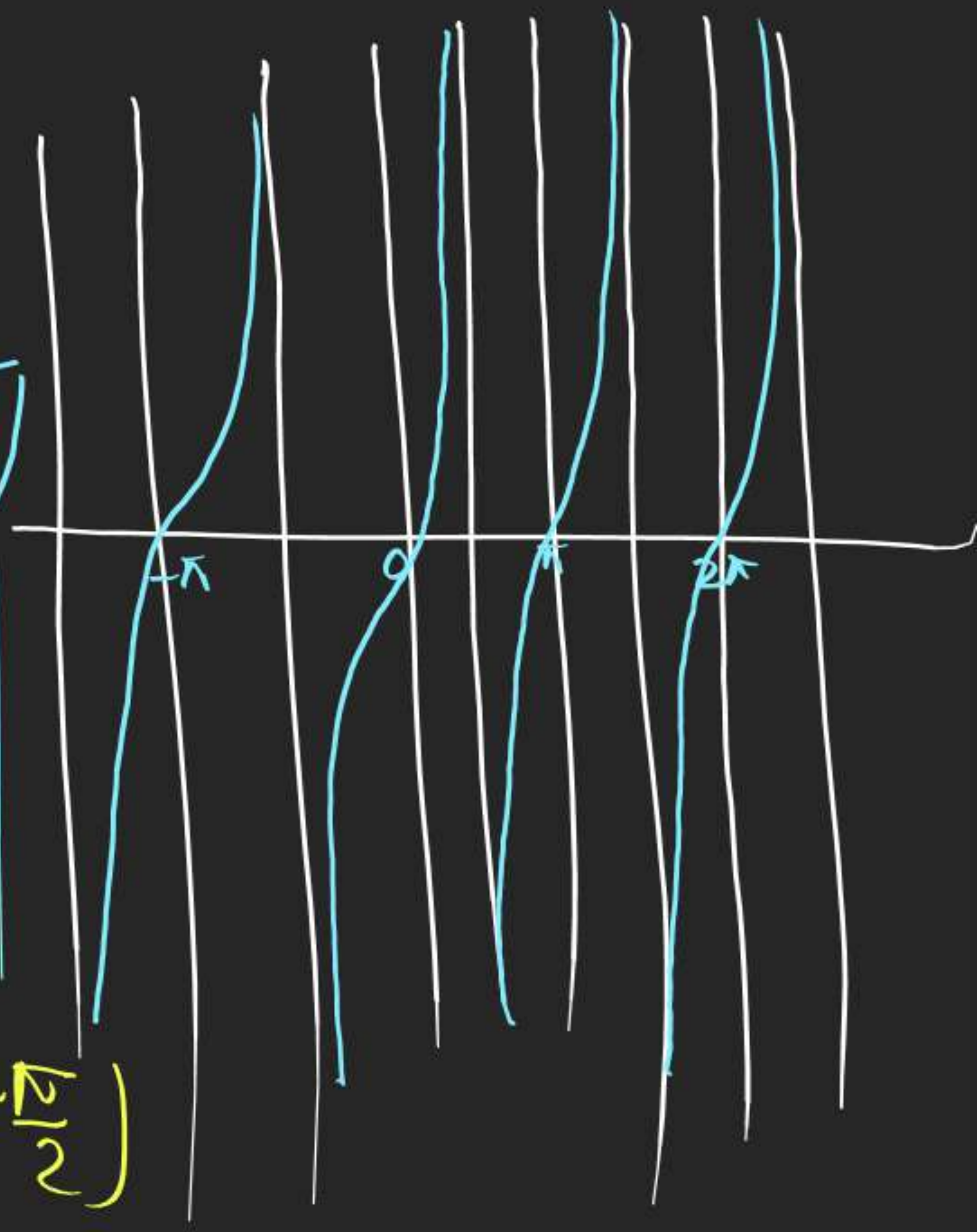
Q $\cos x > 0$ कहाँ?

→ x Axis के ऊपर

$-\frac{\pi}{2} < x < \frac{\pi}{2}$

$x \in \left(2n\pi - \frac{\pi}{2}, 2n\pi + \frac{\pi}{2}\right)$

③ $y = \tan x$



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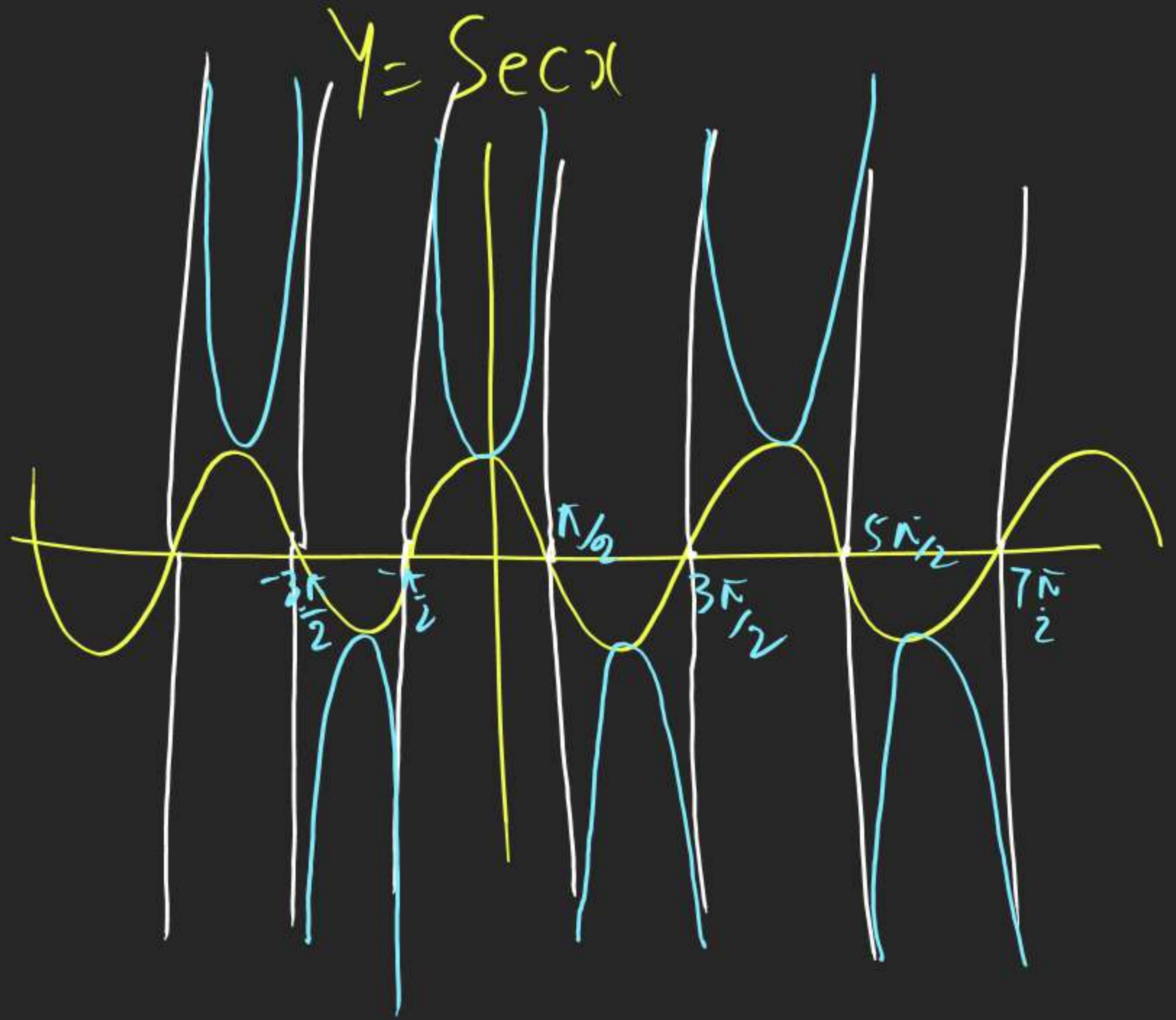
RELATION FUNCTION



$x \in (2n\pi, (2n+1)\pi)$

Q $f(x) = \dfrac{1}{\sqrt{|\sin x| + \sin x}}$ find D_f?

$|\sin x| + \sin x > 0$

$\boxed{\sin x > 0}$

$\sin x + \sin x > 0$

$\boxed{2}\sin x > 0$

+ve

$\boxed{\sin x > 0}$

$x \in (2n\pi, (2n+1)\pi)$

let $\sin x = -ve$

$-\cancel{\sin x} + \cancel{\sin x} > 0$

$0 > 0$

Not Possible

RELATION FUNCTION

Transformation of Graph.

$f(x)$ Ki image X Axis me

$f(x)$ Ki image y Axis

Part of graph Below X Axis will be converted above X Axis

K Pt. Up or down Kar K.

$x=-K$ पर $f(x)$ Ka graph Bnado.

---

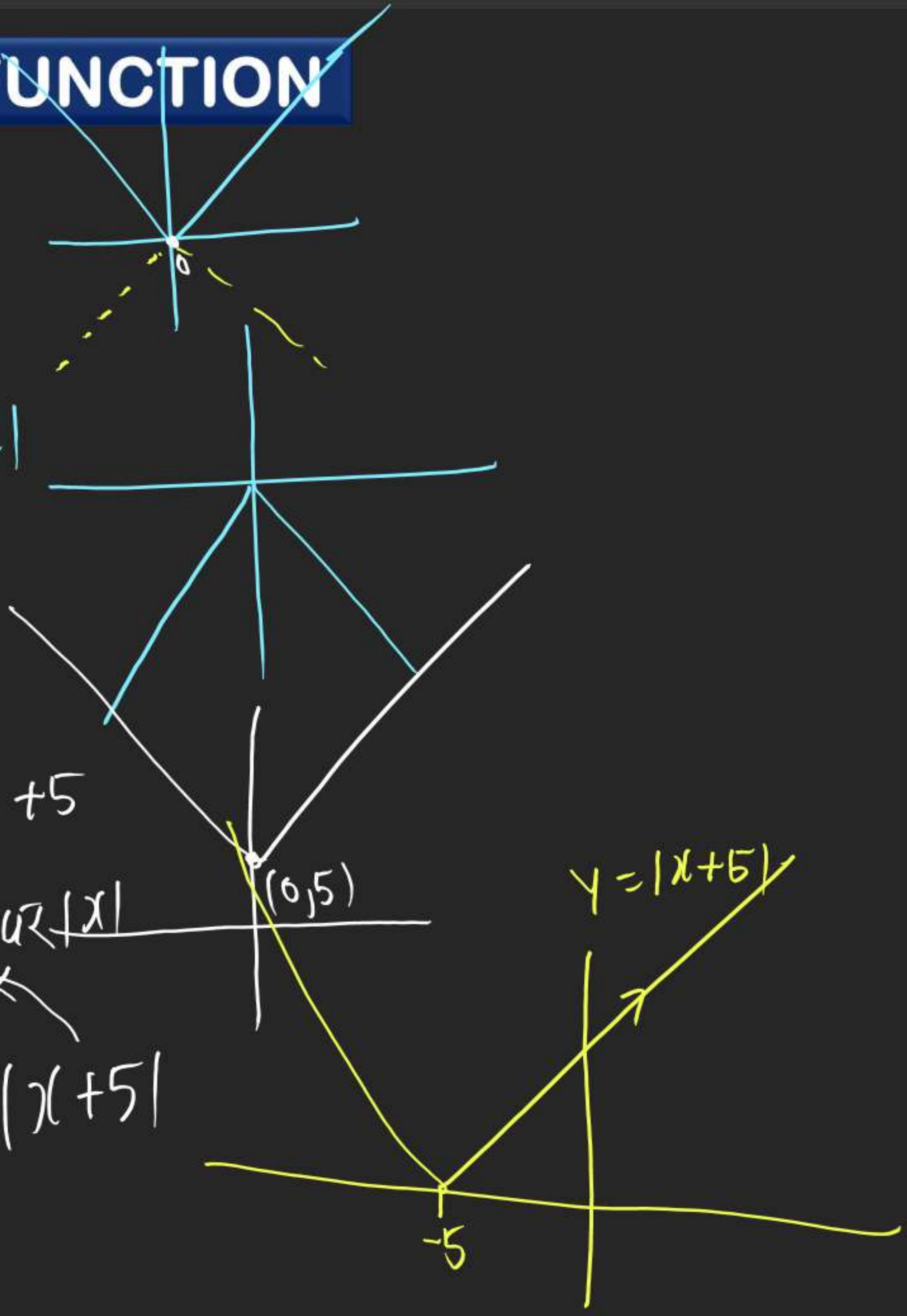
(1) $y=|x|$

(2) $y=-|x|$

(3) $y=|x|+5$

$x=-5$ पर $|x|$

(4) $y=|x+5|$



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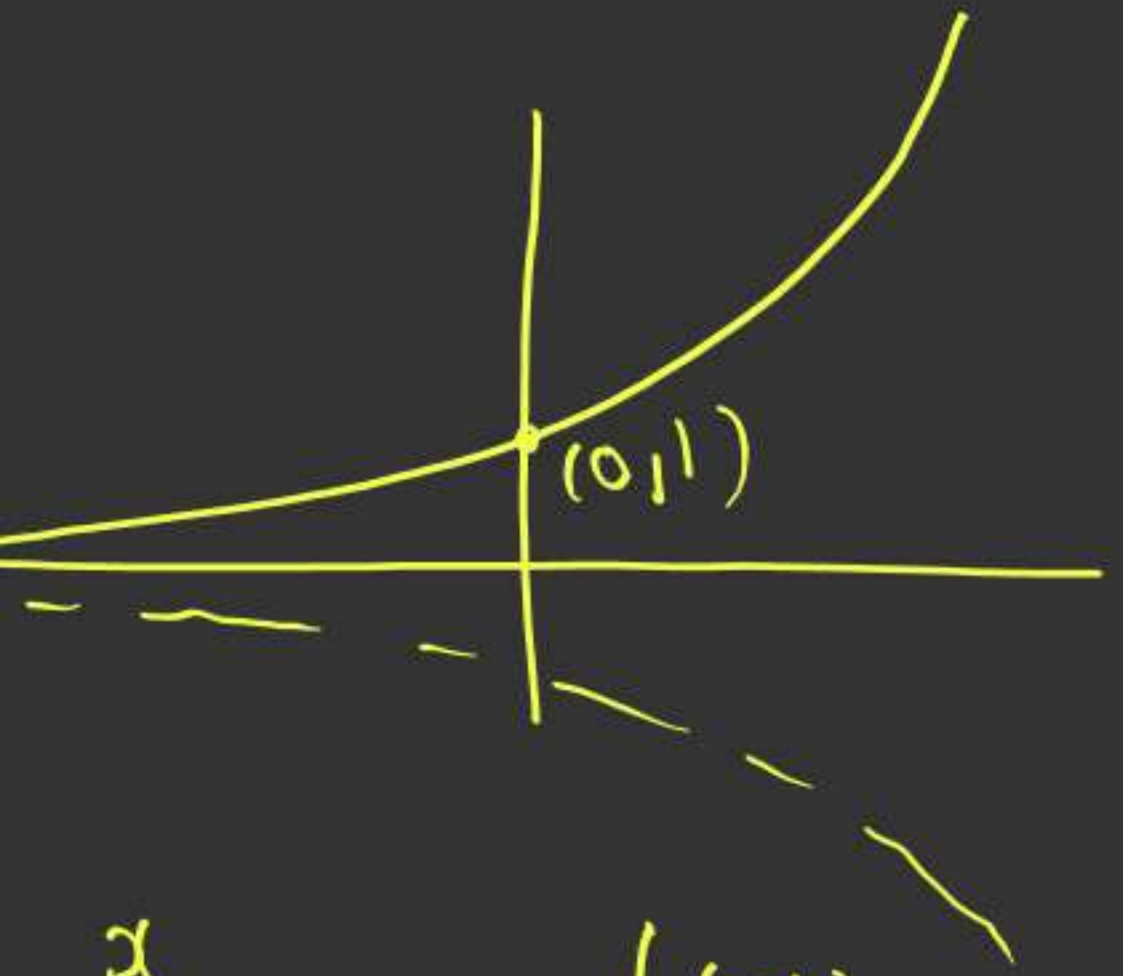
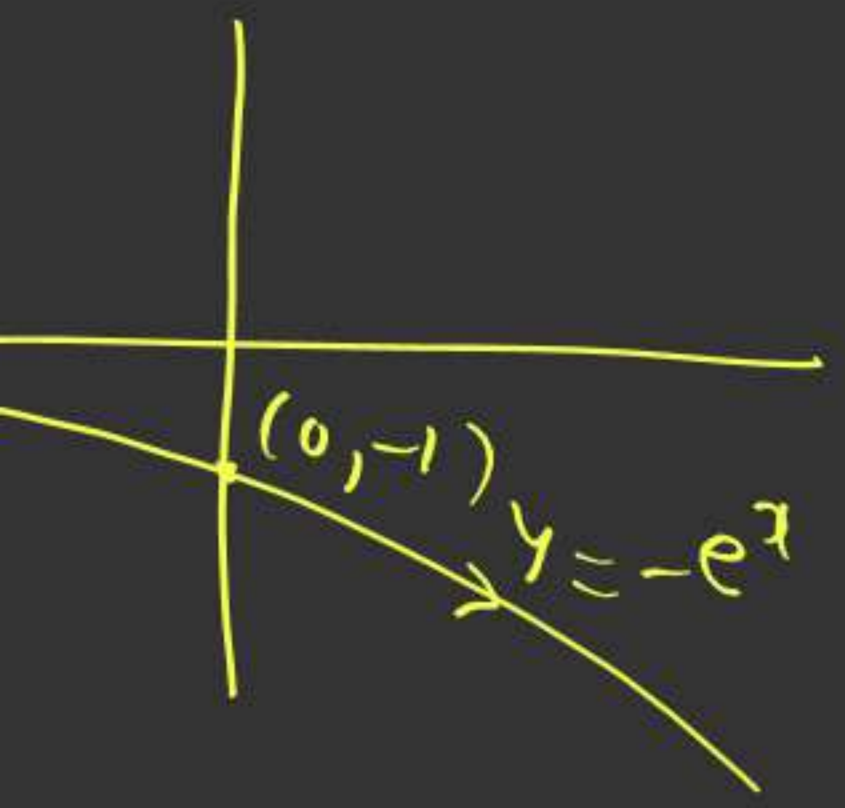
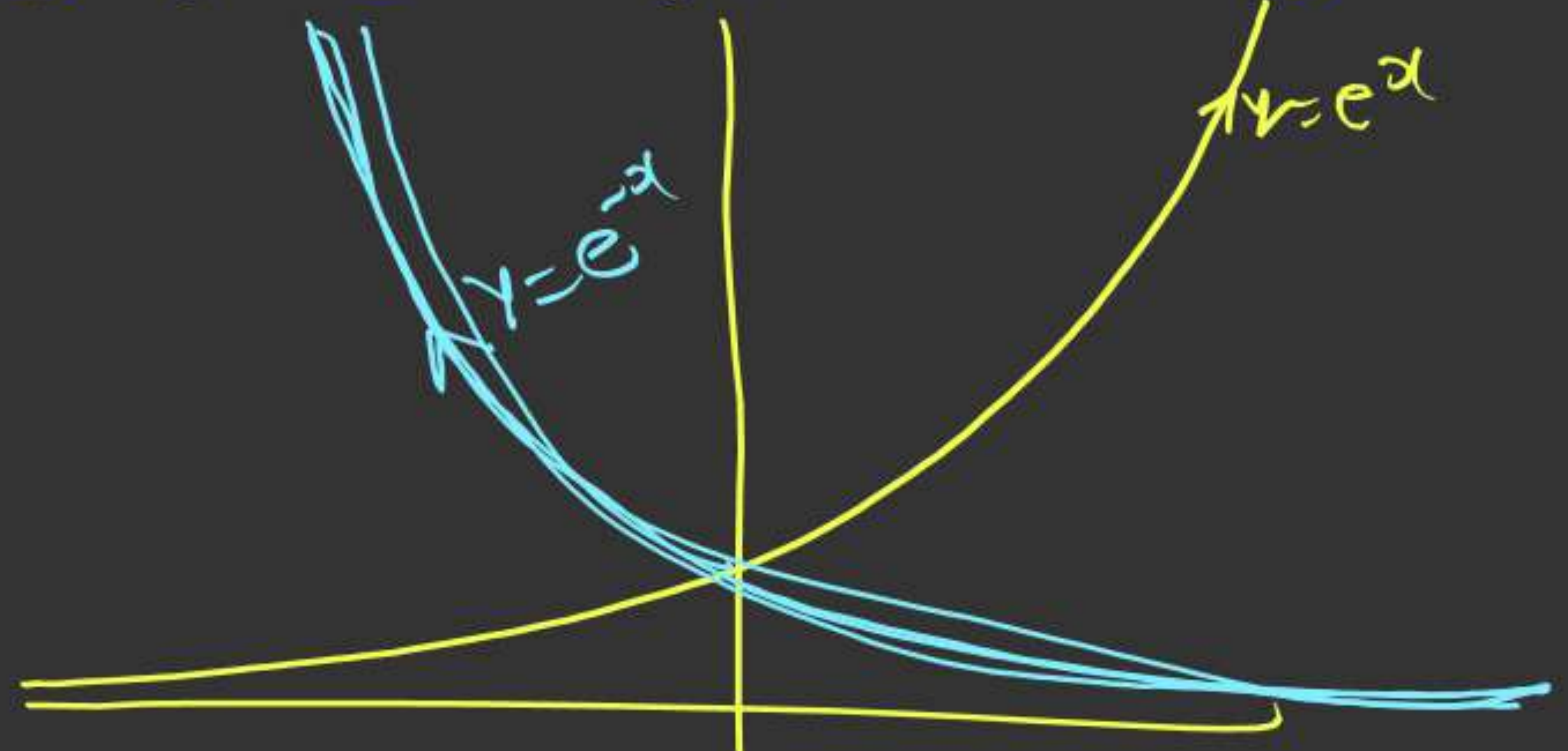


$e^x \longrightarrow -f(x)$

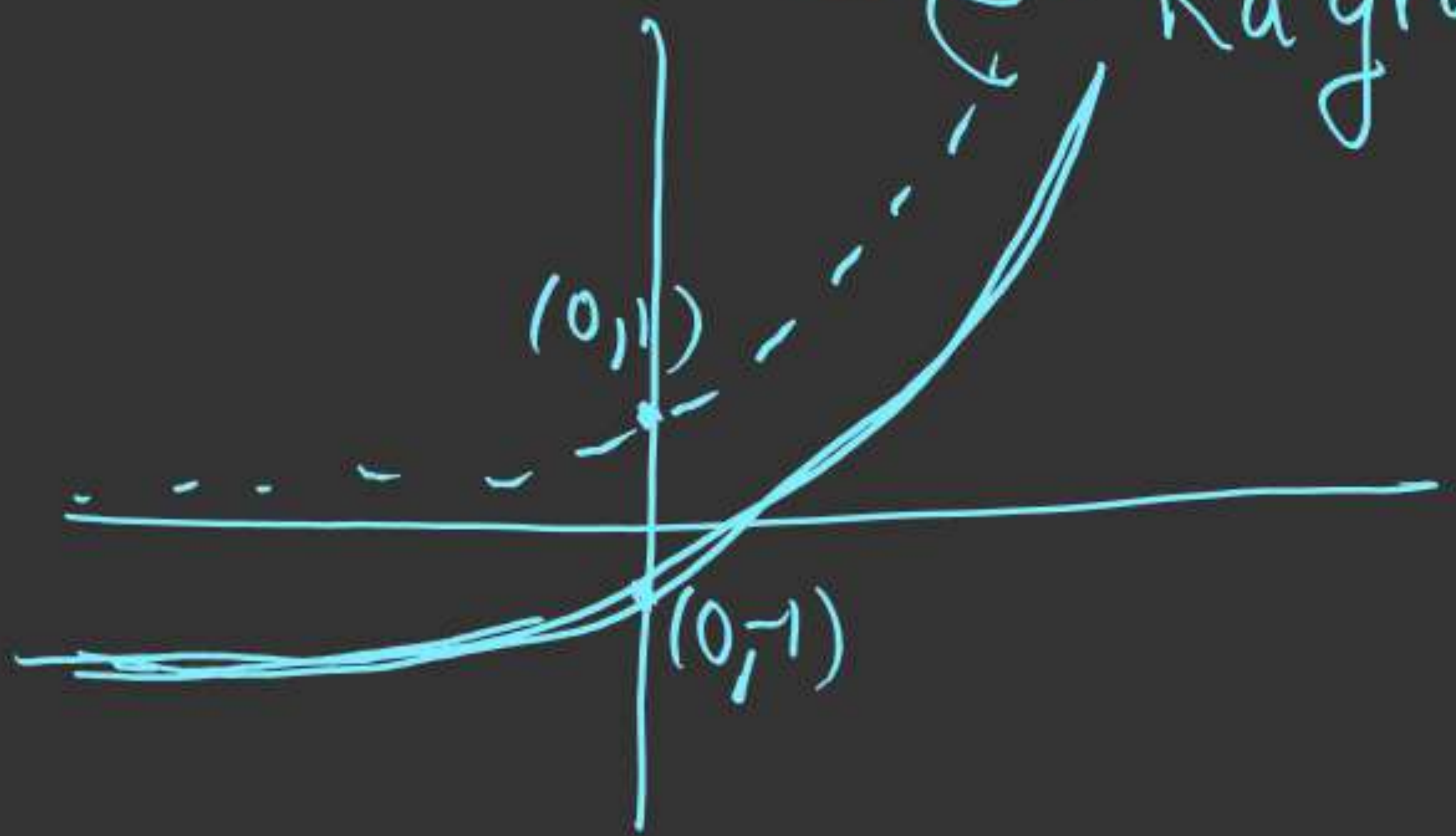


(3) $y = e^{-x} \rightarrow f(-x) \rightarrow$ Image y Axis



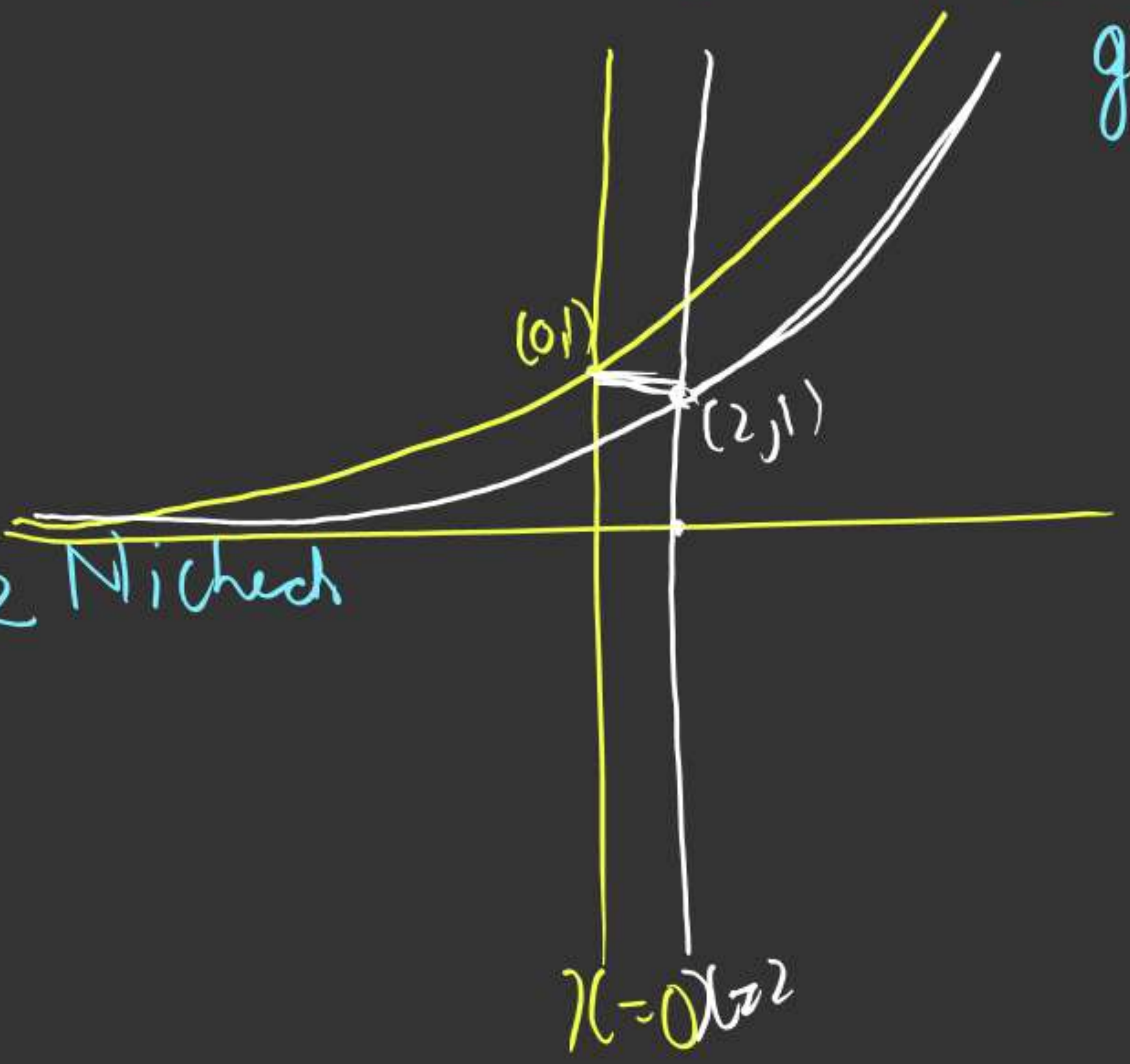
(4) $y = e^x - 2 \rightarrow f(x) + K$

↳ e^x Ka graph -2 Niche



(5) $y = e^{(x-2)} \rightarrow f(x+K)$

↳ $x = 2$ पे $y = e^x$ Ka graph



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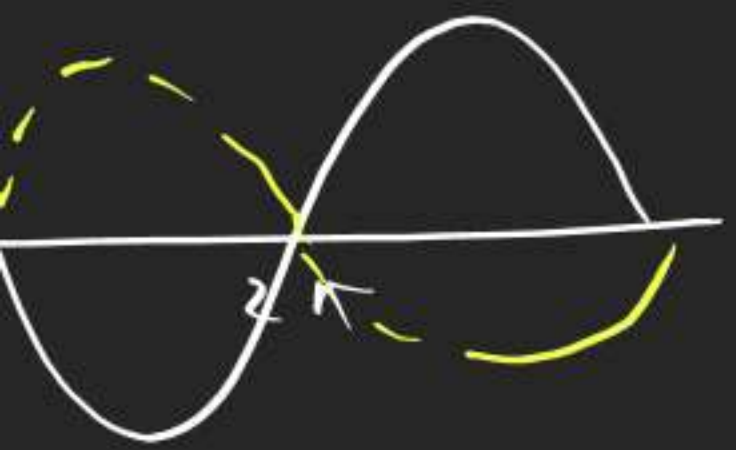
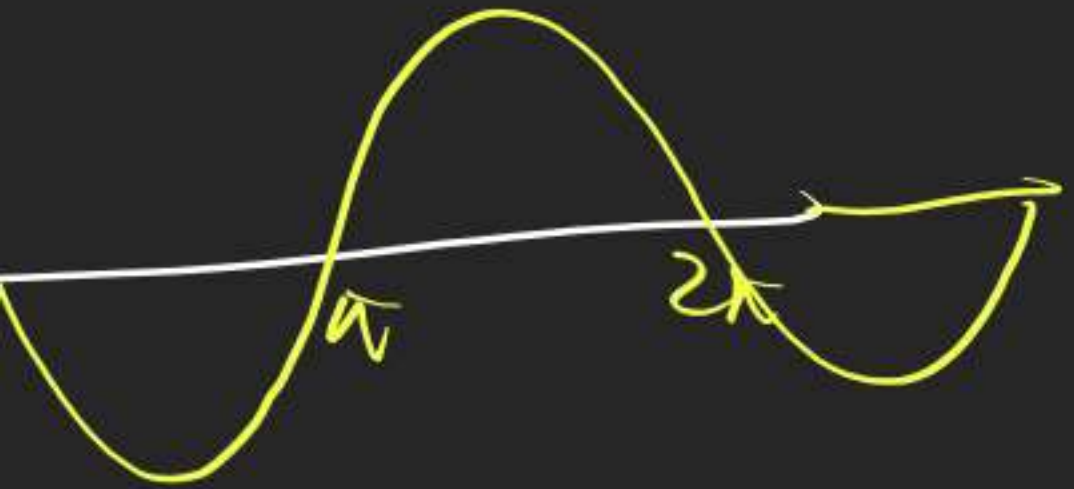
RELATION FUNCTION



$-\sin x$

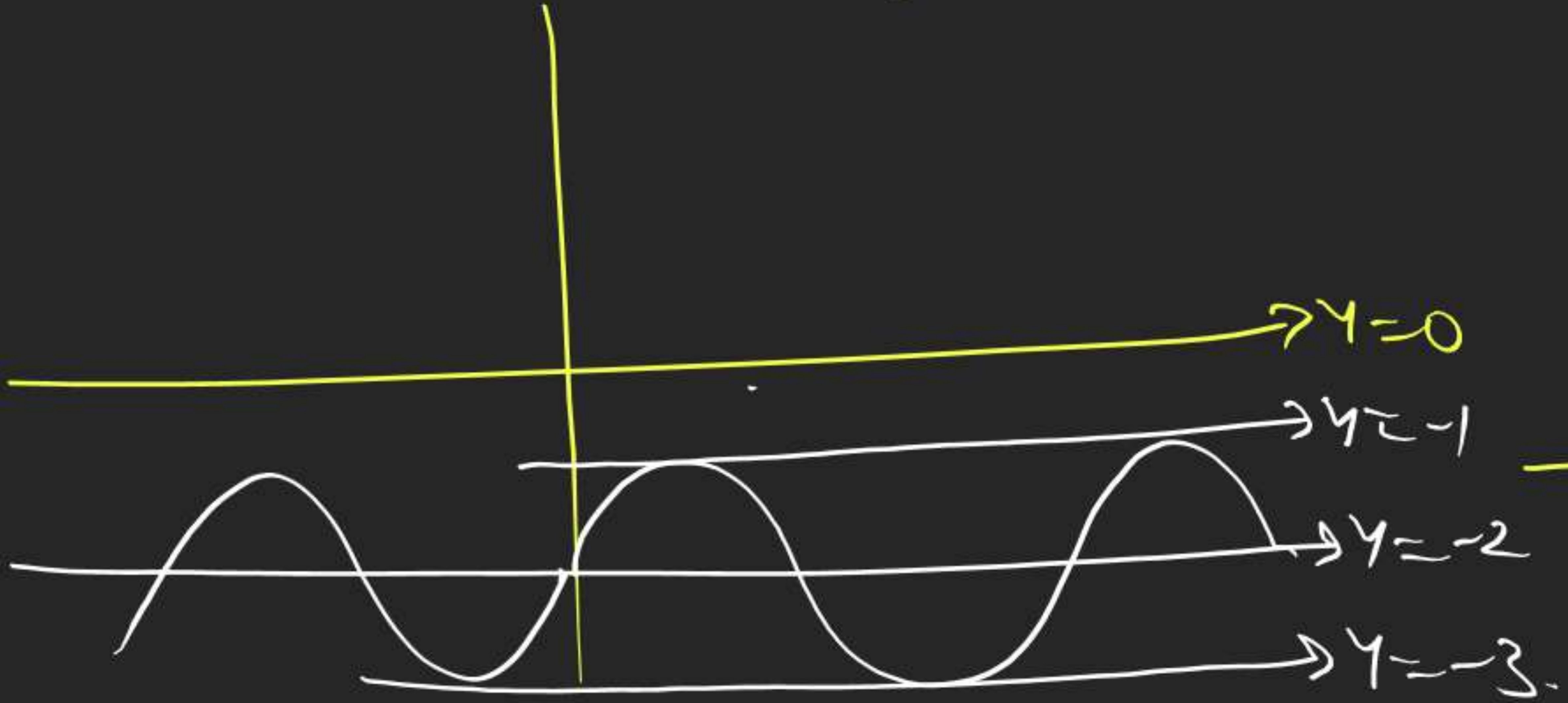


③ $y = \sin x - 2$

↳ 2 pt down.

$R_f \in [-3, -1]$

$D_f \to x \in R$.



④ $y = \sin(x-2)$

$x = 2$ पर $y = \sin x$

DPP → $x = 1$