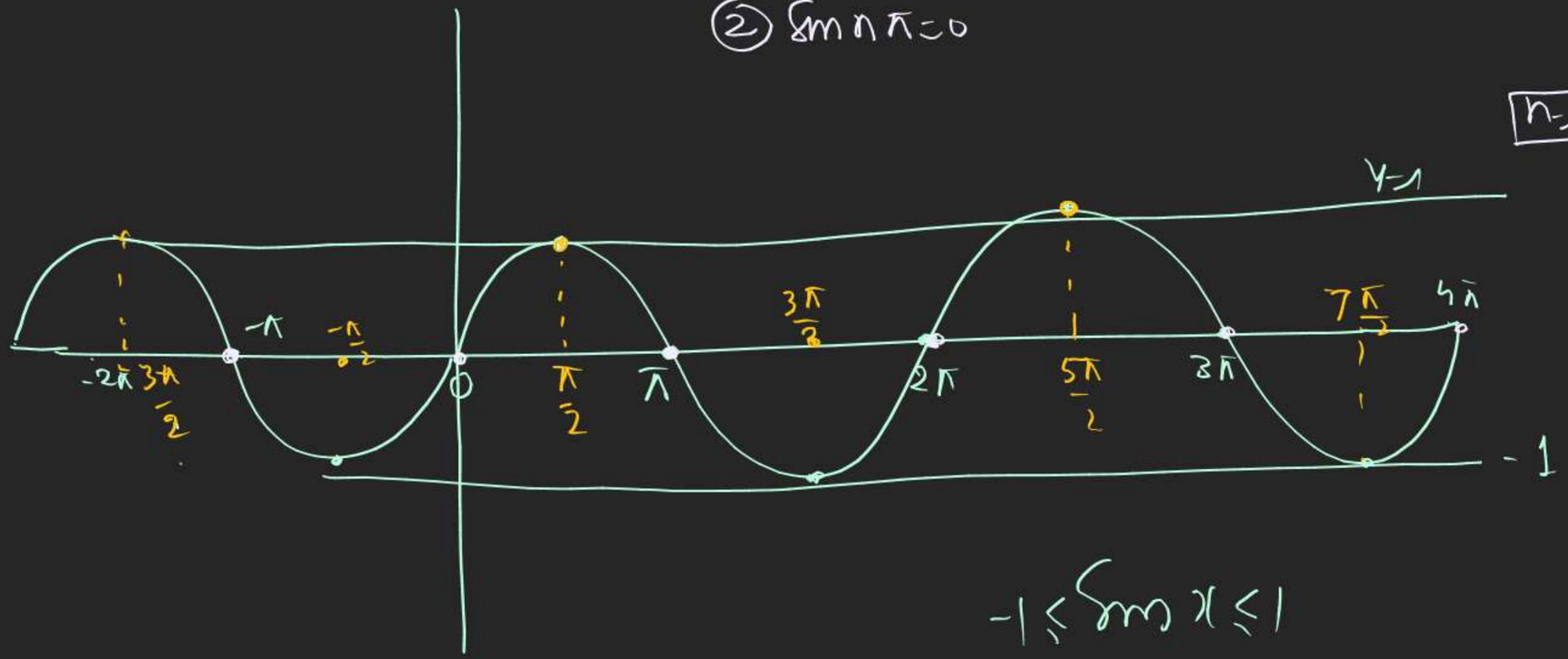
Nishant Jindal

Trigonometry

① $y = \sin x$

① graph यात

② $\sin n\pi = 0$



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

$\sin x = 0 \Rightarrow x = n\pi$

$n = 0$

$\sin 0 = 0$

$\sin \pi = 0$

$\sin 2\pi = 0$

$\sin(-3\pi) = 0$

$\sin(2023\pi) = 0$

} यात $\sin n\pi = 0$

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

② $\sin x = -1 \Rightarrow x = (4n+3)\frac{\pi}{2}$

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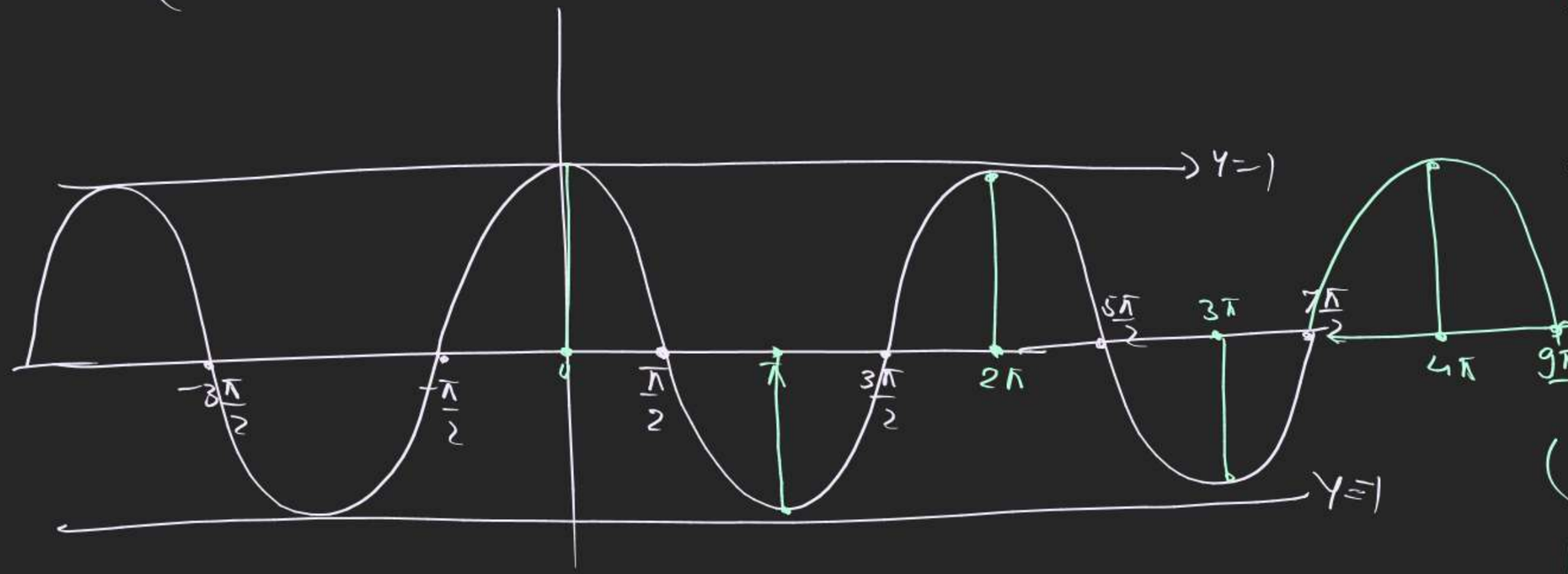
Trigonometry

(2) $y = \cos x$



2π

1) $\cos$ even $\pi = 1$

$\cos(2n\pi) = 1$

2) $\cos$ odd $\pi = -1$

$\cos(2n+1)\pi = -1$

(3) $\cos n\pi = \pm 1$

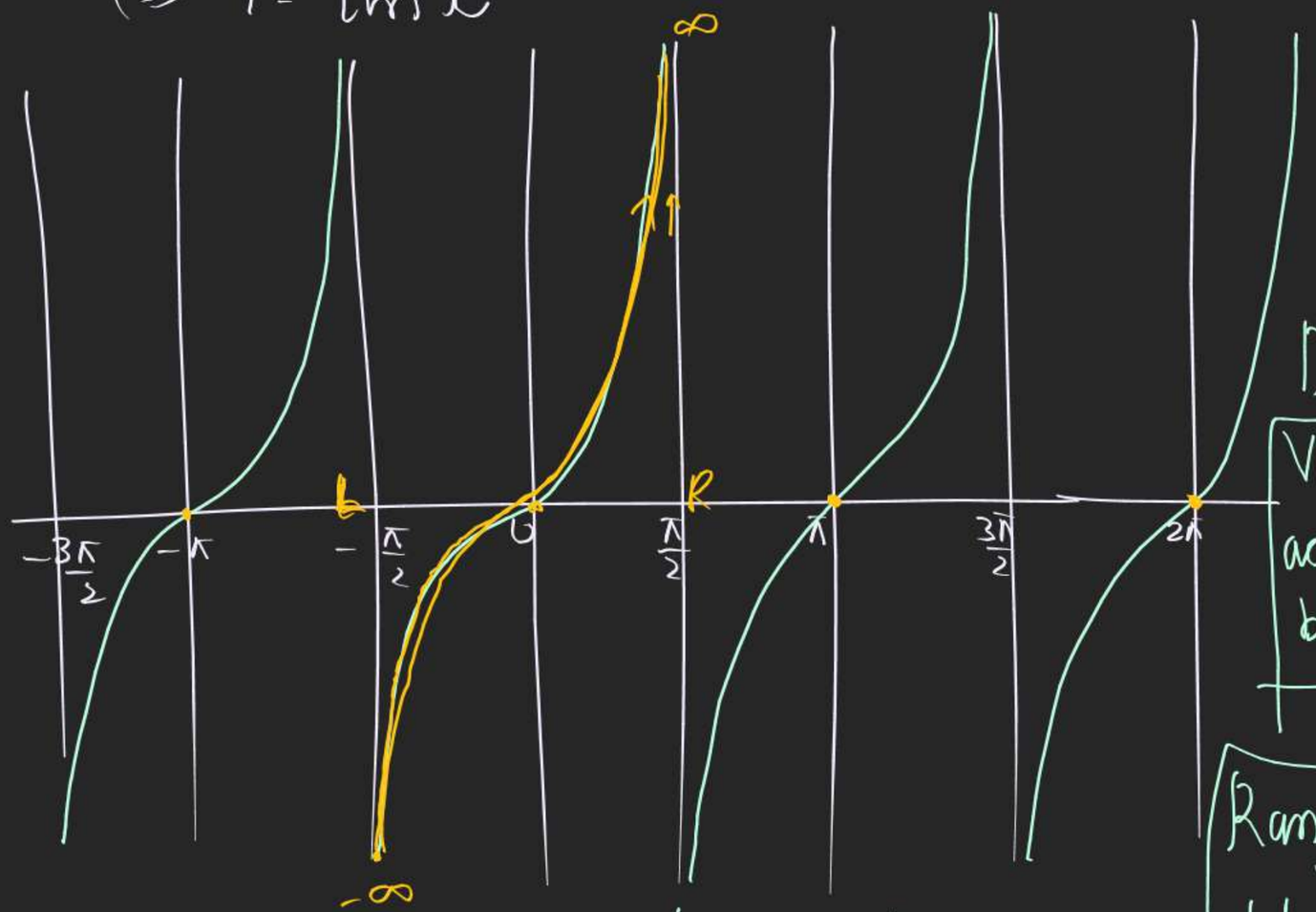
(4) $\cos x = 0$

When $x = (2n+1)\frac{\pi}{2}$

$\tan\frac{\pi}{2} = \frac{\sin\pi/2}{\cos\pi/2} = \frac{1}{0}$

Trigonometry

(3) $y = \tan x$



1) $\tan x = 0$

$\tan 0 = 0$
$\tan\pi = 0$
$\tan 2\pi = 0$
$\tan 3\pi = 0$
$\tan(-2\pi) = 0$

$\Rightarrow \tan n\pi = 0$

Domain
Values of x acceptable by fxn

(2) for $\tan x$

$x \neq (2n+1)\frac{\pi}{2}$

Domain $x \in (-\infty, \infty) - (2n+1)\frac{\pi}{2}$

Range = value of y ht of graph

(3) $-\infty < \tan x < \infty$

Range

Trigo Q Eqn | Seqn | Prc | BT | Coord

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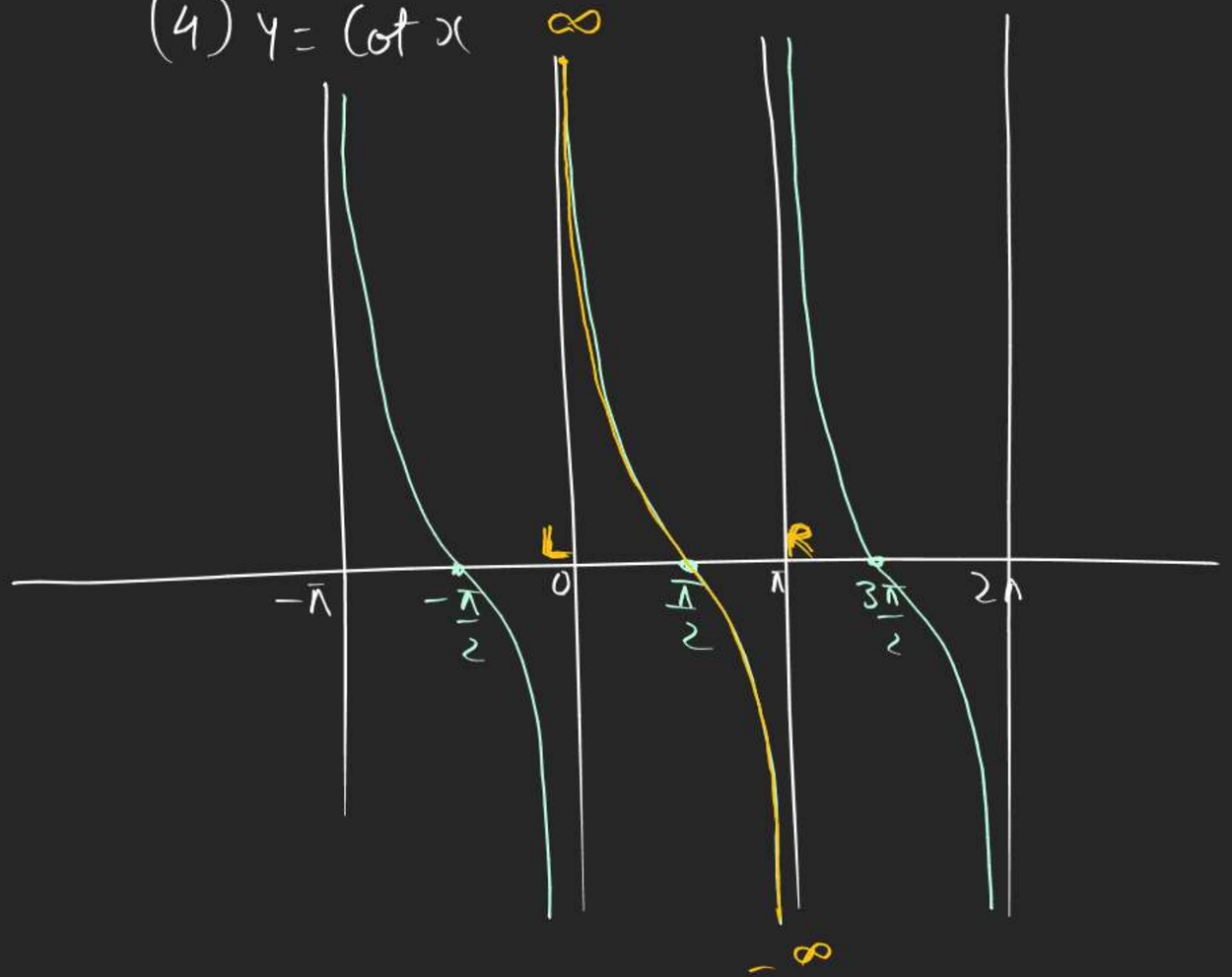
Trigonometry

tan x ka diff^{n} always +ve ↑

(cot x ka diff^{n} always -ve ↓ (graph Niche Kiaune Ayega)

(4) $y = \cot x$



(1) $\cot x = 0$ at

$x = (2n+1)\frac{\pi}{2}$

(2) for $y = \cot x$

$x \neq n\pi$

Domain $x \in (-\infty, \infty) - (n\pi)$

(3) Range $= y \in (-\infty, \infty)$

(4)$_{A}$ $y = \sin x$

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

(B) $y = \cos x$

$\frac{dy}{dx} = -\sin x$

(C) $y = \tan x$

$\frac{dy}{dx} = \sec^2 x \geq 0$

(D) $y = \cot x$

$\frac{dy}{dx} = -\operatorname{cosec}^2 x \leq 0$

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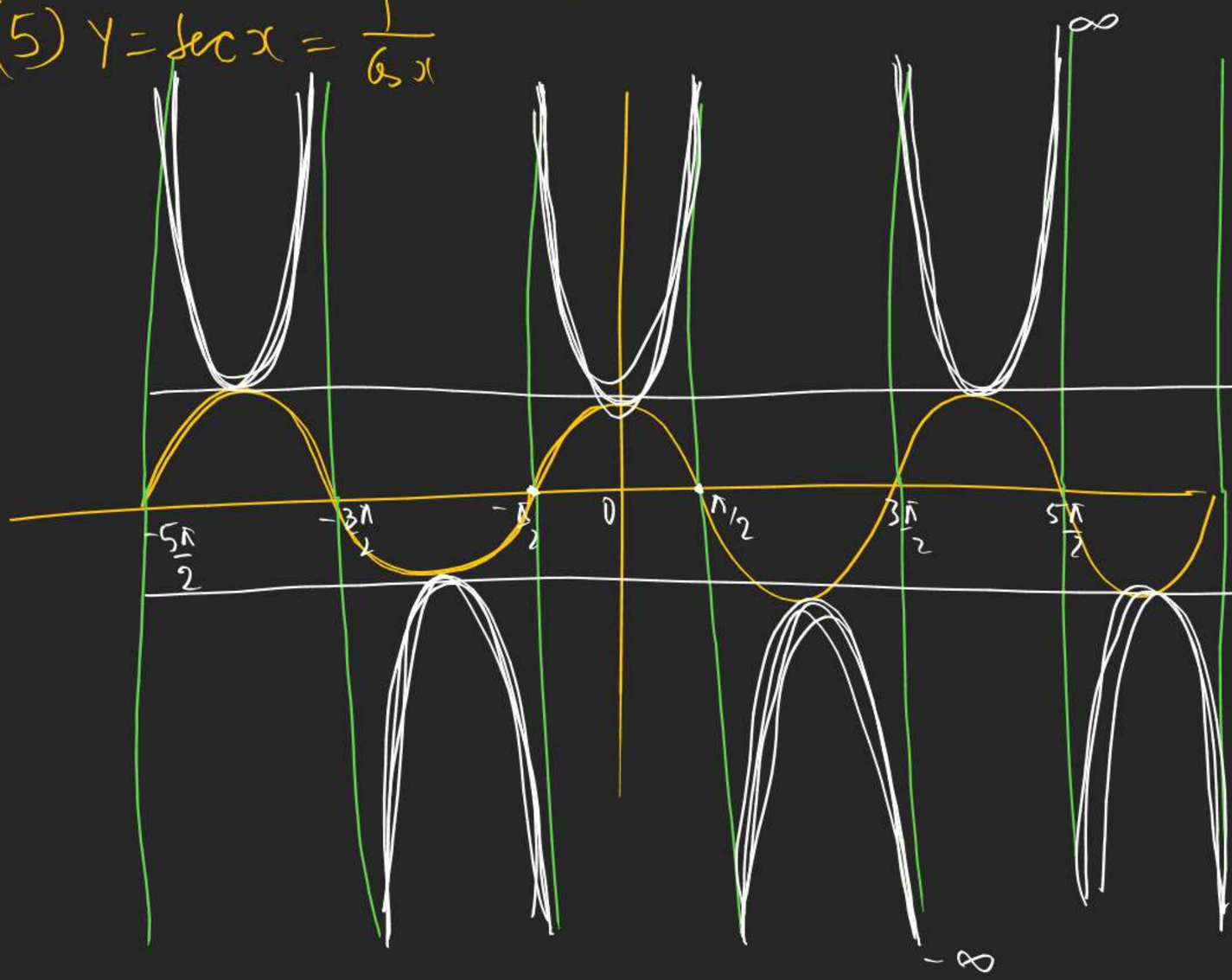
Trigonometry

HW → Search all Net

$Y = \operatorname{Cosec} x$ → Copy

(5) $Y = \sec x = \frac{1}{\cos x}$



① for $Y = \sec x$

$x \neq (2n+1)\frac{\pi}{2}$

Dom $x \in (-\infty, \infty) - (2n+1)\frac{\pi}{2}$

② $Y \in (-\infty, -1] \cup [1, \infty)$

Range

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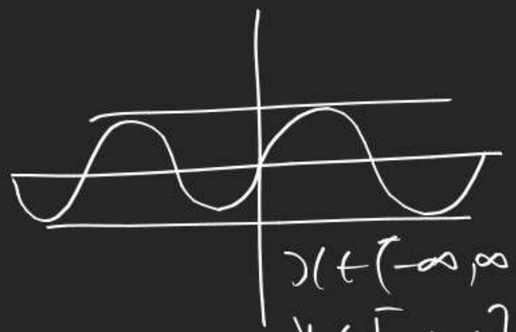
Trigonometry

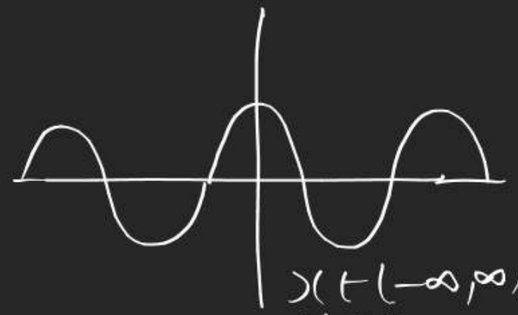
① $y = \sin x$



$x \in (-\infty, \infty)$

$y \in [-1, 1]$

② $y = \cos x$

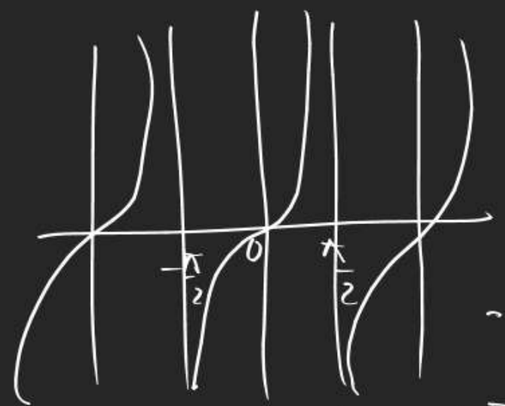


$x \in (-\infty, \infty)$

$x \in R$

$y \in [-1, 1]$

③ $y = \tan x$



$x \neq (2n+1)\frac{\pi}{2}$

$y \in R$

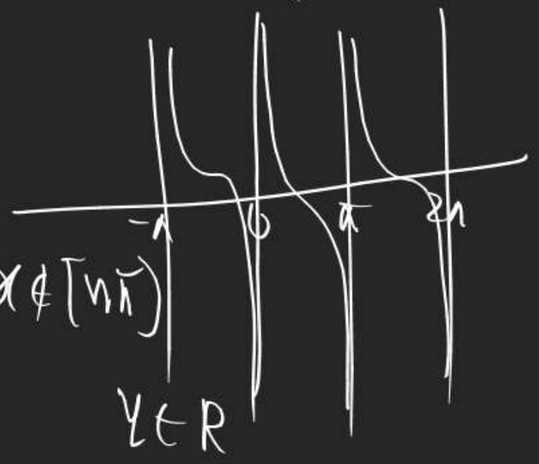
$y \in (-\infty, \infty)$

1) $\sin n\pi = 0$

2) $\cos n\pi = \pm 1$

3) $\cos(2n+1)\frac{\pi}{2} = 0$

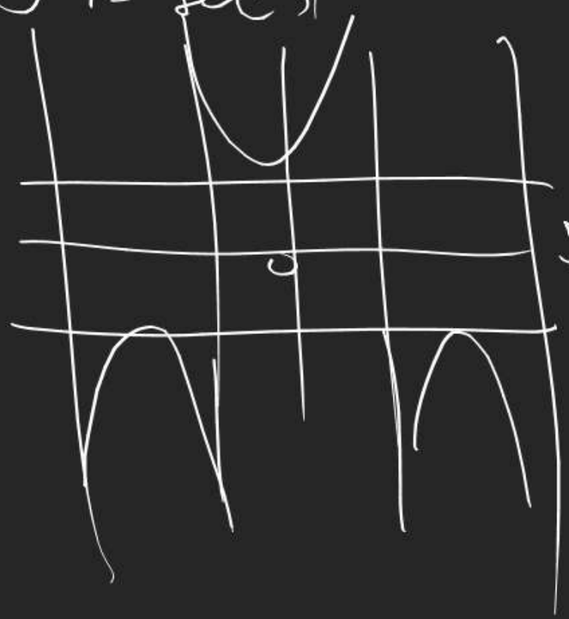
④ $y = \cot x$



$x \neq [n\pi]$

$y \in R$

⑤ $y = \sec x$



$x \neq (2n+1)\frac{\pi}{2}$

$y \in (-\infty, -1] \cup [1, \infty)$

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Trigonometry

Concept

Adv →

$y = \cos x = 0$

$x = (2n+1)\frac{\pi}{2}$

$y = \sin x = 0$

$x = n\pi$

Q1 $y = \sec x$'s Dm ?

$= \frac{1}{(\cos x)}$

$\cos x \neq 0$

$x \neq (2n+1)\frac{\pi}{2}$

Df : $x \in R - (2n+1)\frac{\pi}{2}$

Q2 $y = \tan x$ Domain

$y = \frac{\sin x}{\cos x}$

$y = \sin x \times \frac{1}{(\cos x)}$

R ∩ $\cos x \neq 0$

$x \neq (2n+1)\frac{\pi}{2}$

$x \in R - (2n+1)\frac{\pi}{2}$

$\therefore x \in R - (2n+1)\frac{\pi}{2}$

Q3 $y = \operatorname{cosec} x$'s Dd ?

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

$\sin x \neq 0$

$x \neq n\pi$

$x = R - (n\pi)$

Dm

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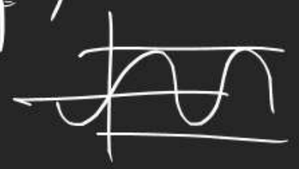
Trigonometry

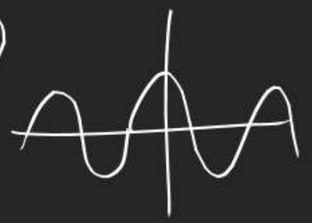
Range of Trigo fxn.

1) $y = \sin x$ R_f ?



$y \in [-1, 1]$

2) $y = \cos x$ R_f ?



$y \in [-1, 1]$

3) $y = \tan x$'s R_f ?

$y \in R$

$y \in (-\infty, \infty)$

Concept

$x \to ax + b$

Range Remains Same

(1) $y = \sin(3x)$'s R_f ?

$y \in [-1, 1]$

(2) $y = \sin(3x - 25)$'s R_f ?

$y \in [-1, 1]$

(3) $y = \sin\left(\frac{x}{2} + \frac{\pi}{19}\right)$'s R_f

$y \in [-1, 1]$

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Trigonometry

Q10 $y = \tan(3x-7)$'s R_f ?

Same as $y = \tan x$

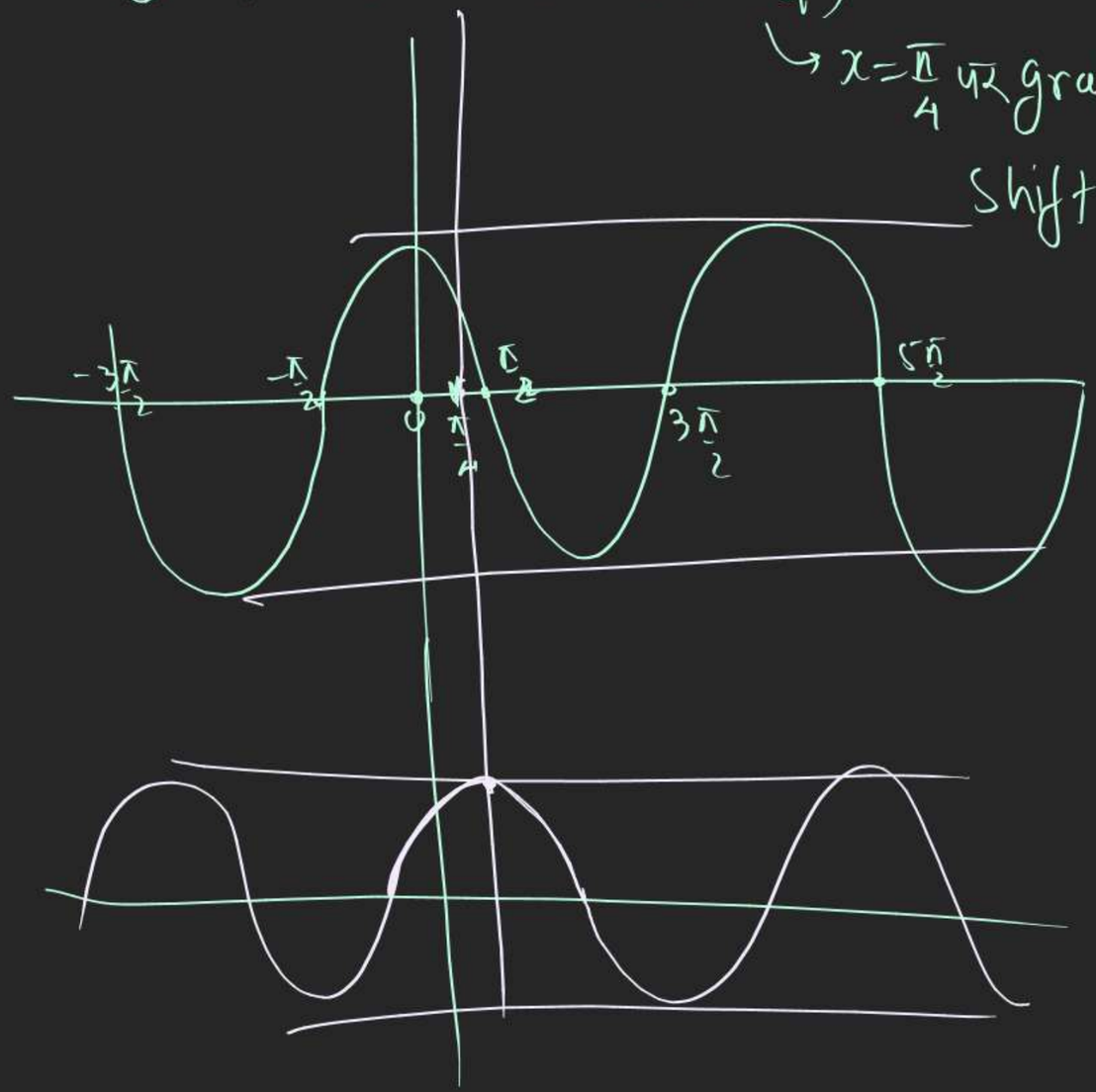
$y \in R$

Q11 $y = \cos(x - \frac{\pi}{4})$'s R_f ?

$y \in [-1, 1]$

① $y = \cos x$ & $y = \cos(x - \frac{\pi}{4})$

↳ $x = \frac{\pi}{4}$ ka graph shift



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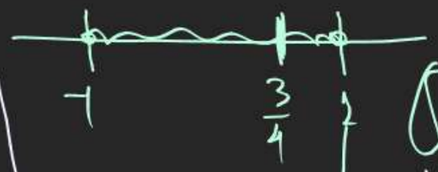
Trigonometry

Concept

1) $(\quad)^2 \geq 0$

2) $(\quad)^2 = 0$ Kab Bnatu h??

Ans. When fxn Inside Become Zero



Q12 $y = (\sin x - \frac{3}{4})^2$ Can give value 0 or not?

⇓

If $\sin x - \frac{3}{4}$ is PSBL then $(\sin x - \frac{3}{4})^2$ will be 0.

$-1 \leq \frac{3}{4} \leq 1$ as $\frac{3}{4}$ Comes bet^n -1 to +1 hence $\sin x = \frac{3}{4}$ Possible

$\Rightarrow (\sin x - \frac{3}{4})^2 = 0$ PSBL

Q13 $y = (\cos x - 2)^2$ Can give 0 or not?

If $\cos x - 2 = 0$ PSBL then it is Psbl.

$\Rightarrow \cos x = 2$

$-1 \leq 2 \leq 1$

Not Psbl.

$\Rightarrow (\cos x - 2)^2 = 0$ Not Psbl.

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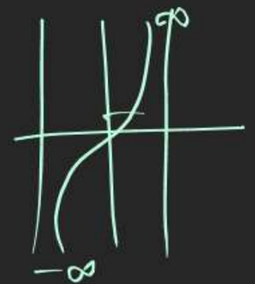
Trigonometry

Q14 $(\tan x - 2)^2$ Can give 0 or not?

$\Rightarrow \tan x = 2$ Psbl??

Yes!!!

as $\tan x$'s Range $\in (-\infty, \infty)$



Q15 $Y = \sin^2 x$'s Rf?

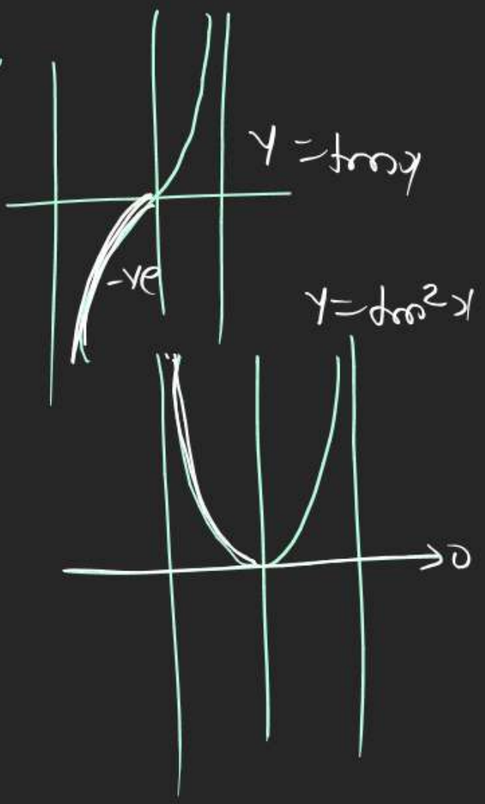
① $\sin^2 x \geq 0$

② $-1 \leq \sin x \leq 1$

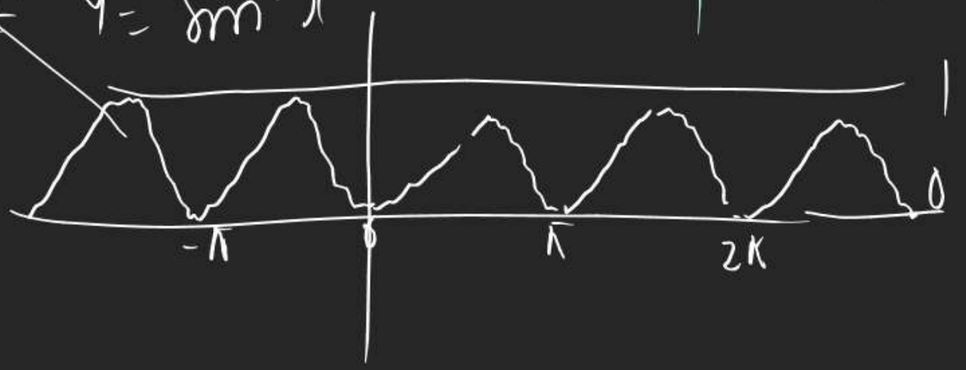
⇒ $0 \leq \sin^2 x \leq 1$

Q16 $Y = \tan^2 x$'s Rf

$\infty > \tan^2 x \geq 0$



Adv $Y = \sin^2 x$



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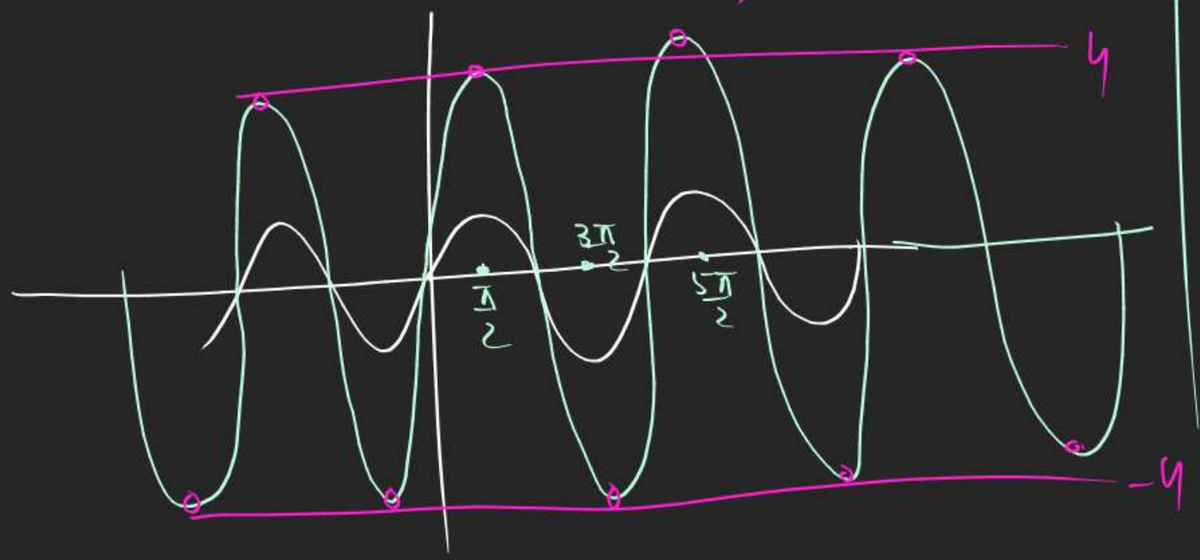
Trigonometry

Q. 17 $y = 4 \tan x \cdot \cos x$'s R_f ?

$y = 4 \dfrac{\sin x}{\cos x} \times \cos x \quad (\cos x \neq 0$

$x \neq (2n+1)\dfrac{\pi}{2}$

$y = 4 \sin x \in (-4, 4)$



Q 18 R_f of $y = \cos^2\left(\frac{x}{4}\right) - \sin^2\left(\frac{x}{4}\right)$

Yad Aaya → $\cos^2\theta - \sin^2\theta = \cos 2\theta$

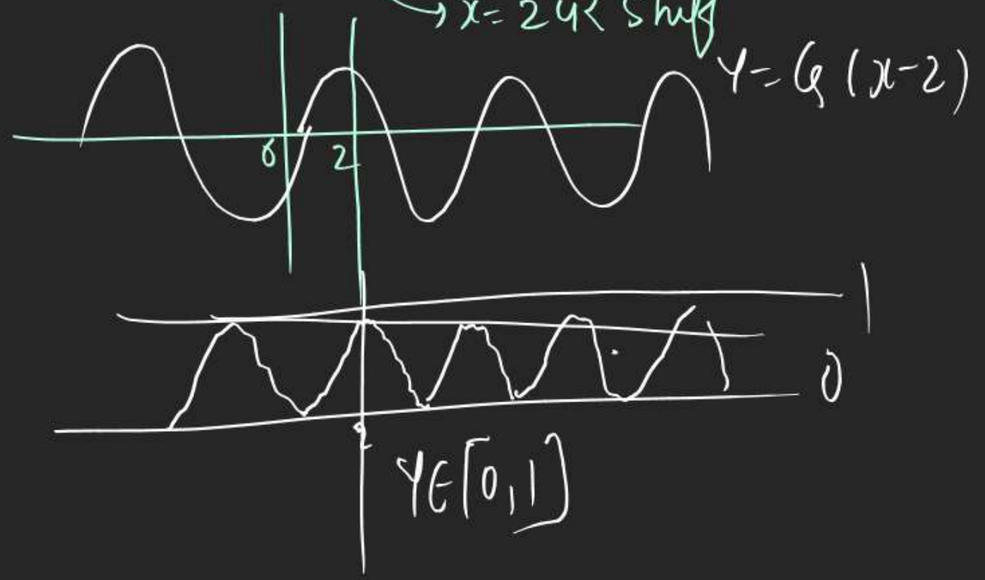
$y = \cos^2\left(\frac{x}{4}\right) - \sin^2\left(\frac{x}{4}\right) = \cos\frac{x}{2}$

$R_f \in [-1, 1]$

Q $y = \cos^2(x-2)$ R_f ?

→ $x = 2$ pe shift

$y = \cos(x-2)$



$y \in [0, 1]$

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Trigonometry

Interesting Q14 $y = \sqrt{\sin x}$'s R_f ?

Concept: $\sqrt{\ }$ gives +ve Quantities only.

$\sqrt{\sin x} \in [0, 1]$

Q21 $y = 2\sin x$'s R_f

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

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

$\therefore y \in [-2, 2]$

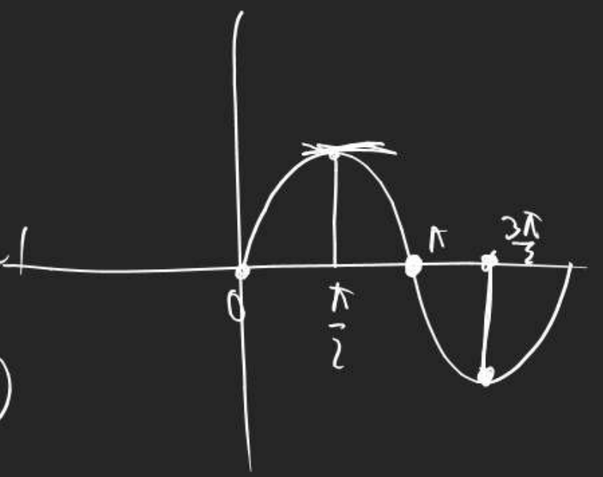
Q20 $y = \sin\sqrt{x}$'s R_f ?

$y \in [-1, 1]$

$x = \frac{\pi^2}{4} \rightarrow y = \sin\sqrt{\frac{\pi^2}{4}} = \sin\frac{\pi}{2} = 1$

$x = \frac{9\pi^2}{4} \rightarrow y = \sin\sqrt{\frac{9\pi^2}{4}} = \sin\frac{3\pi}{2} = -1$

$x = \pi^2 \rightarrow y = \sin\sqrt{\pi^2} = \sin\pi = 0$



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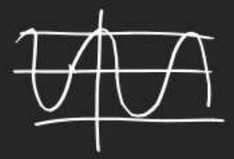
Trigonometry

Q12 $y = \frac{1}{\sqrt{2}} \cos x$'s Rf.



$-1 \le \cos x \le 1$

$-\frac{1}{\sqrt{2}} \le \frac{1}{\sqrt{2}} \cos x \le \frac{1}{\sqrt{2}}$

$\therefore y \in \left[-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right]$

Q23 $y = \sin^2\left(\frac{15\pi}{8} - 4x\right) - \sin^2\left(\frac{17\pi}{8} - 4x\right)$'s Rf?

This matches to $\sin^2 A - \sin^2 B$

$= \sin(A+B) \cdot \sin(A-B)$

$\sin\left\{\left(\frac{15\pi}{8} - 4x\right) + \left(\frac{17\pi}{8} - 4x\right)\right\} \cdot \sin\left\{\left(\frac{15\pi}{8} - 4x\right) - \left(\frac{17\pi}{8} - 4x\right)\right\}$

$\sin\left(\frac{32\pi}{8} - 8x\right) \cdot \sin\left(-\frac{2\pi}{8}\right)$

$y = +\sin\frac{\pi}{4} \sin(8x) = \frac{1}{\sqrt{2}} \boxed{\sin 8x}$'s Range

$-1 \le \sin 8x \le 1$

$-\frac{1}{\sqrt{2}} \le \frac{1}{\sqrt{2}} \sin 8x \le \frac{1}{\sqrt{2}}$ $\therefore y \in \left[-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right]$