TRIGONOMETRY SESSION 1 30 11 23

Thursday, November 30, 2023 5:33 PM

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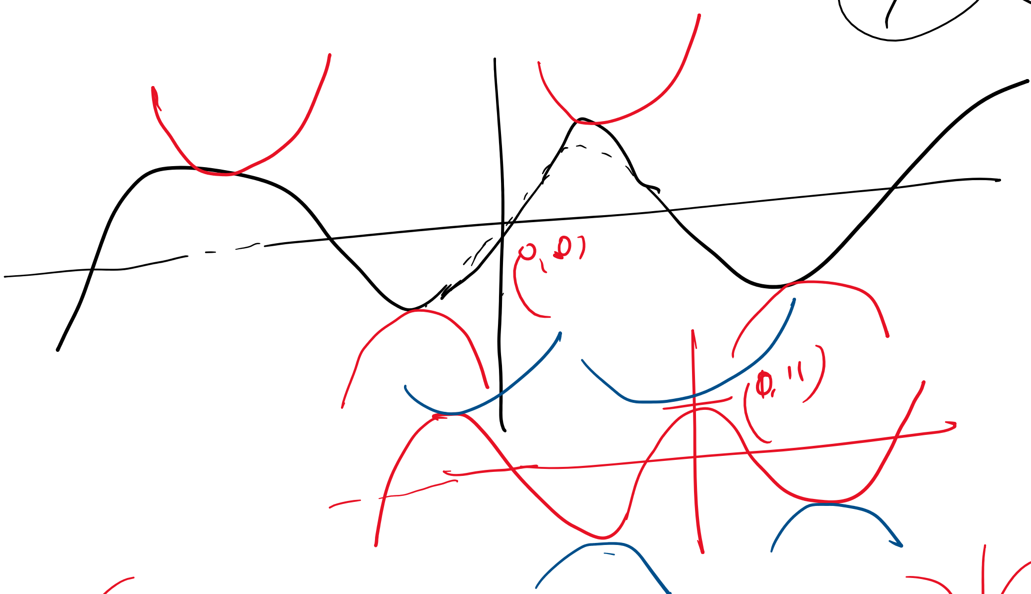
Important Topics ISI → Trigo.

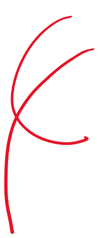
I Graphical Representations ..

$\sin x \quad \sin 2x$

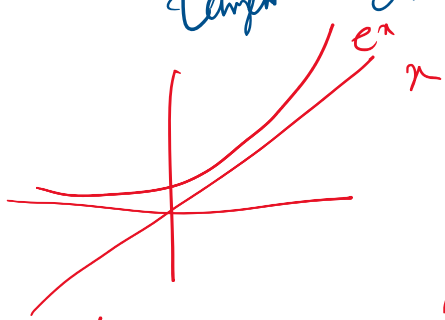
$\sin^{-1} x \quad \sin^{-1} 2x$

$\sin x \quad \sin^{-1} x$

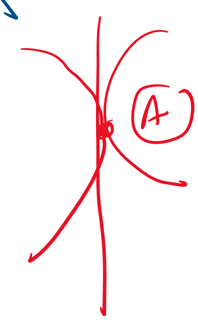




Tangent vs Intersecting



$e^x \neq x$



$\sin x \rightarrow$

$\boxed{y} = \sin x$ — Domain, Range

$\sin(a^x + b^x) = y$

Domain & Range

multiple domain is possible.

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

$0 < a < 3$

$0 < b < 9$

$0 < c < 6$

$y = 0$

$3^x + 9^x + 6^2$

$a = 3$, $b = 2$

Global vs Local max

ndh

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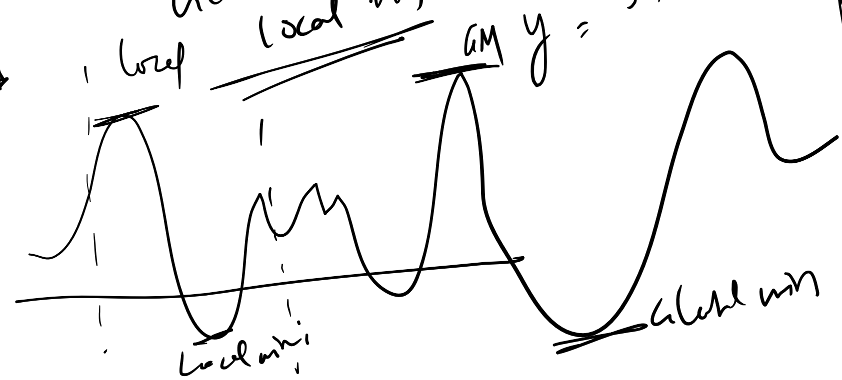
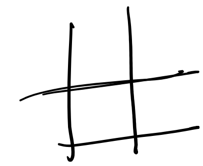
Global vs Local max

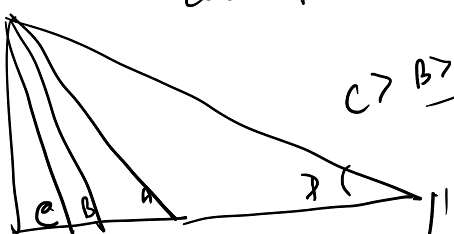
$y = 0$

$y = 3^n + a^2 + 6$

$a = 3$
$b = 2$
$C = 1$

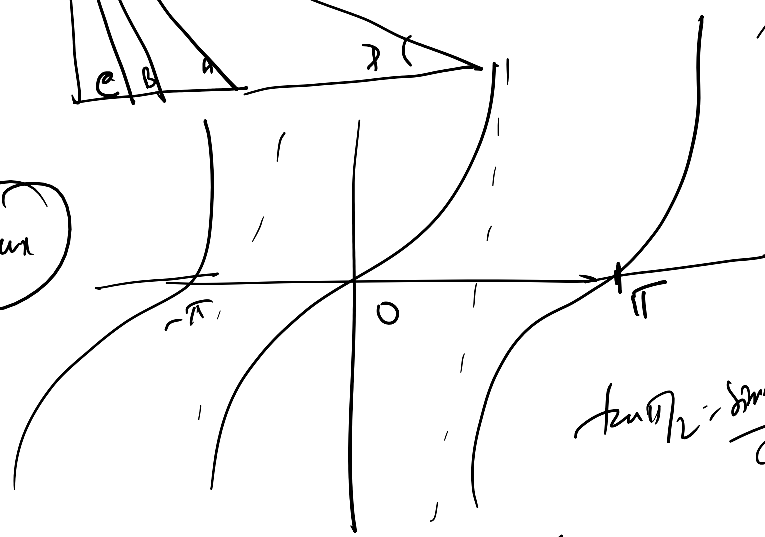






C > B > A > D ..

Steeper the line
Higher the angle

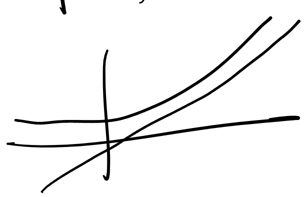


Sin	Cos
$\sin 0^\circ \to 0$	1
$\sin 30^\circ \to \frac{1}{2}$	$\frac{\sqrt{3}}{2}$
$\sin 45^\circ \to \frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$
$\sin 60^\circ \to \frac{\sqrt{3}}{2}$	$\frac{1}{2}$
$\sin 90^\circ \to 1$	0

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

$= 1/0 \to$

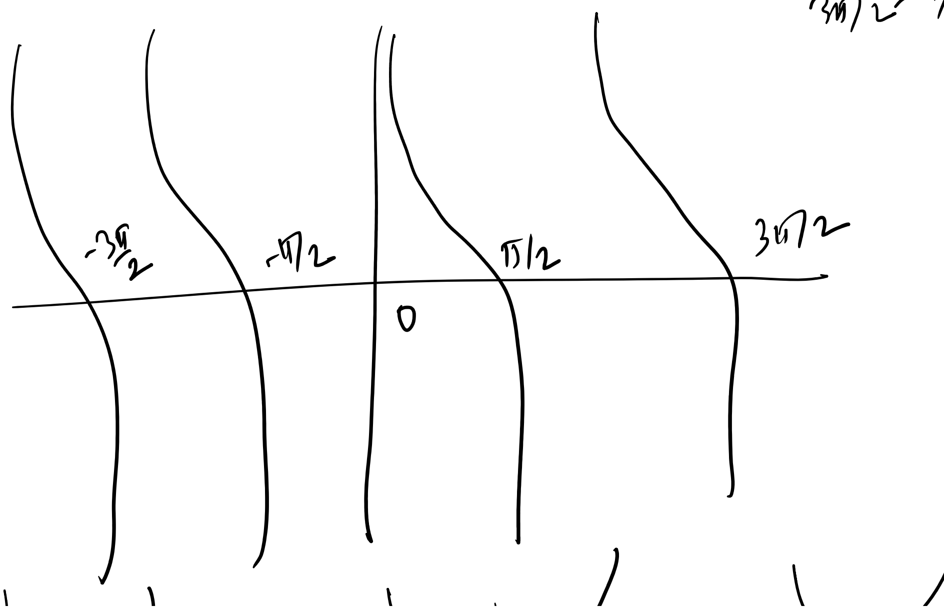
Asymptotic ..

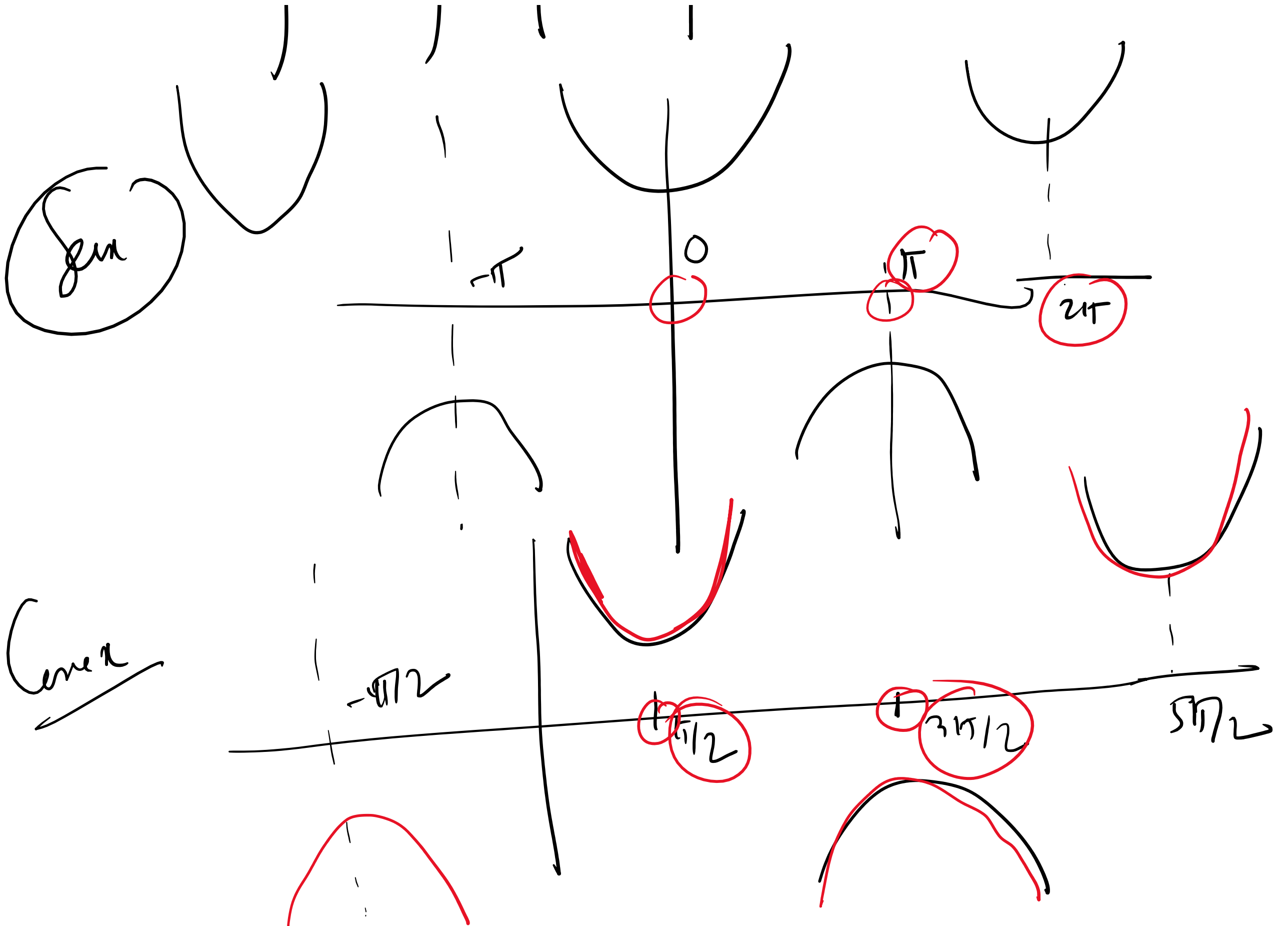


$\cot 0 = \frac{\cos}{\sin} = \frac{1}{0} = ..$

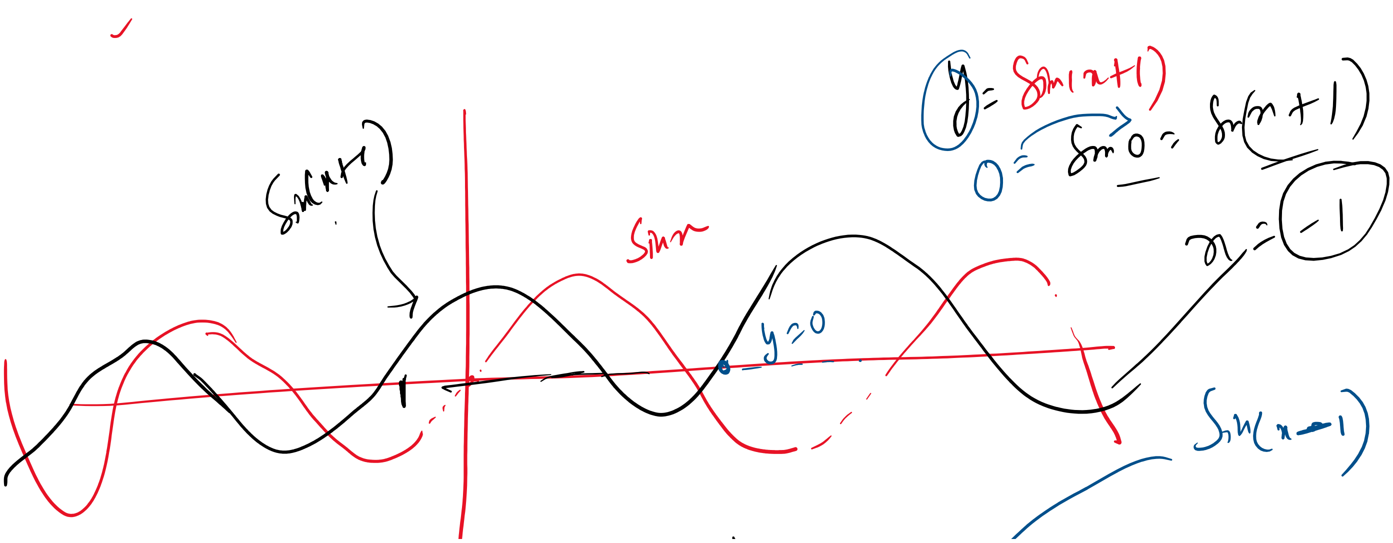
$\pi/2 - (-\pi/2) = \pi$

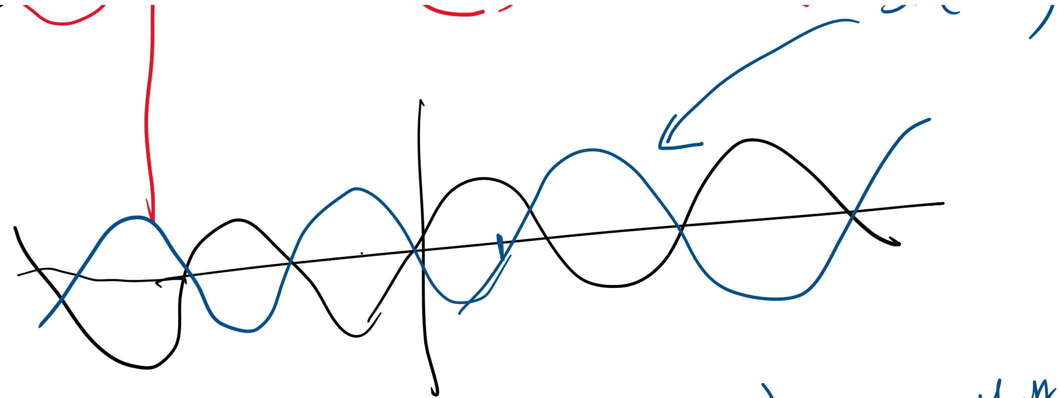
$3\pi/2 - \pi/2 = \pi$





Note: all the curve are at a distance of 2π





If $\sin x \longrightarrow \sin(x+\alpha)$ then shift left

+ve mean left −ve mean Right

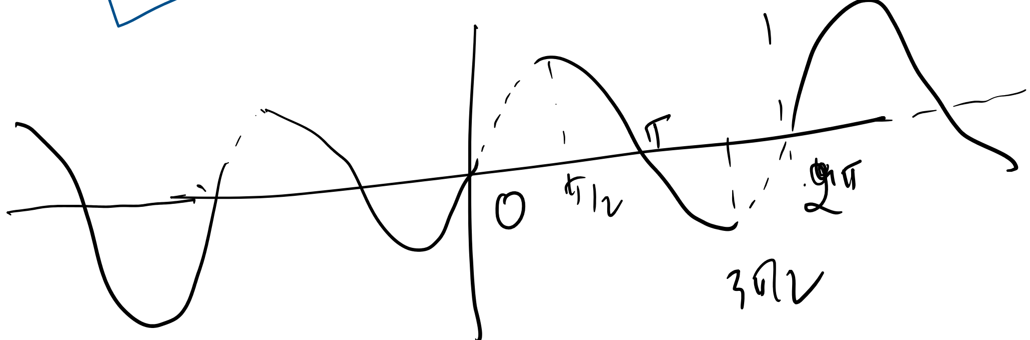
$\boxed{\text{Hard question}}$

Draw $\sin(x/2)$

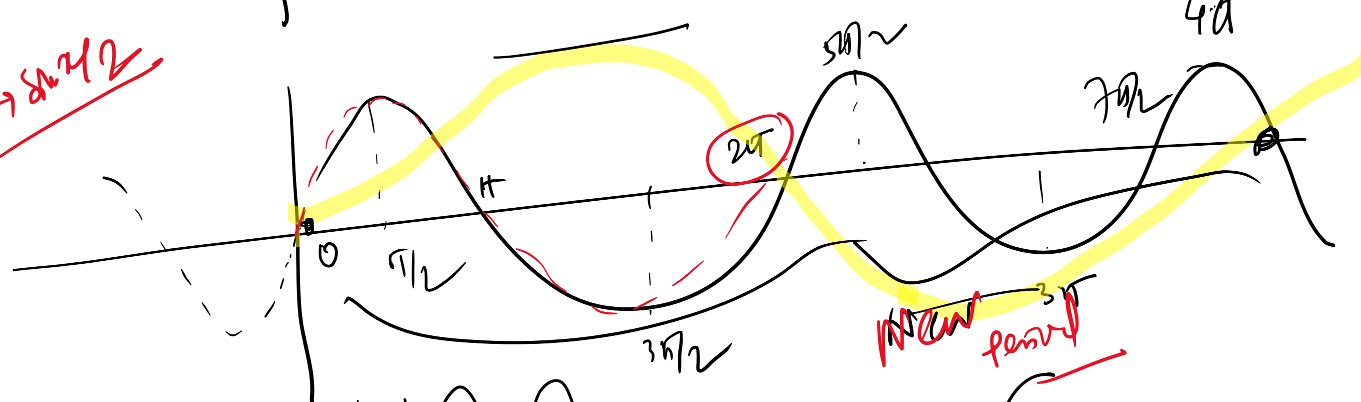
$y = \frac{\sin x}{1}$ Period $\frac{2\pi}{1}$

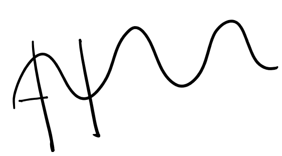
$y = \sin\left(\frac{x}{2}\right) \Rightarrow \sin x \cdot \frac{1}{2}$

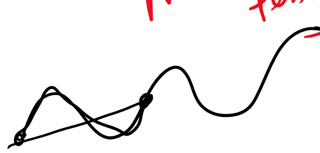
$\frac{2\pi}{\frac{1}{2}} \rightarrow 4\pi$



$\sin x \rightarrow \sin x/2$







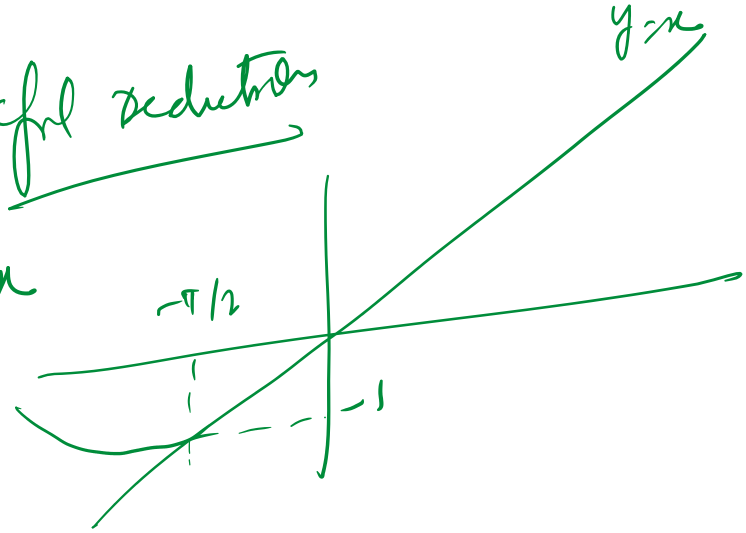
$\sin x \rightarrow \sin 2x$ | $\sin x \rightarrow \sin x/2$

Period → π | Curve will expand ..

Curve will shrink

Sin x → 0 ... Curve ... | Curve ... expand ...

Some Useful deductions



$\sin x > x$

$\tan x > x$

$0 < x < \pi/2$

$\boxed{\tan x > x > \sin x}$ in $(0, \pi/2)$

$\sin x > x > \tan x$ $(-\pi/2, 0)$

Some important Identities

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

$\Rightarrow (\sin^2 A - \sin^2 B)$

ISE (1995)

$\cos^2\theta + \cos^2(\alpha+\theta) - 2\cos\alpha\cos\theta\cos(\alpha+\theta)$

$= \cos^2\theta + \cos(\alpha+\theta)\left[\cos(\alpha+\theta) - \frac{2\cos\alpha}{\cos\theta}\right]$

$\cos^2\theta + \cos(\alpha+\theta)\,[\ldots\ \cos\ldots - \sin\alpha\sin\ldots - 2\cos\alpha\cos\theta]$

$= \cos^2\theta + \cos(\alpha+\theta)\left[\cos\alpha\cos\theta - \sin\alpha\sin\alpha - 2\cos\alpha\cos\theta\right]$

$= \cos^2\theta - \cos(\alpha+\theta)\left[\cos\alpha\cos\theta - \sin\alpha\sin\alpha - 2\cos\alpha\sin\alpha\right)$

$= \cos^2\theta - \left[\cos^2\alpha - \sin^2\theta\right)$

$= \cos^2\theta + \sin^2\theta - \cos^2\alpha$

$= 1 - \cos^2\alpha$ $\quad (\sin^2 + \cos^2 = 1)$

Hence independent of α ..

Don't do $\sin\theta = \sin\alpha$

$\theta = \alpha$

So

$\sin\theta = 0$

$\theta = n\pi$

$\cos\theta = 0 \quad \theta = (2n+1)\pi/2$

$\sin\theta = \sin\alpha \Rightarrow \theta = n\pi + (-1)^n\alpha$

Non-zero

$\sin\theta = \sin\alpha$

$\theta = n\pi + (-1)^n \alpha$

Problem: $2^{1+|\cos x|+|\cos x|^2+|\cos x|^3+\dots\infty} = 4 = 2^2$

find $\boxed{\cos}$??

$1+|\cos x|+|\cos x|^2+\dots\infty = 2$

$2^{\frac{1}{1-|\cos x|}} = 2^2$

$\frac{1}{1-|\cos x|} = 2^1$

$|\cos x| = 1/2$ $\quad \cos x = \pm\frac{1}{2}$

$x = 2\pi n \pm \pi/3$

Total soln of $|\cos x| = \sin x$ $\quad 0 \le x \le 4\pi$

If $\cos x \ge 0$, $x \in \left[0, \frac{\pi}{2}\right] \cup \left[\frac{3\pi}{2}, \frac{5\pi}{2}\right] \cup \left[\frac{7\pi}{2}, 4\pi\right]$

@ $\cos x = \sin x$

$\tan x = 1$

$x = n\pi + \pi/4$

$x = \pi/4, 5\pi/4, 9\pi/4, \frac{13\pi}{4}, \dots$

$\boxed{\text{Sine}}$

Next week

More tests

Next video
More tests
(graded)
Complete test...

8 # $\boxed{\text{Solve}}$

$$|\sqrt{3}\cos x - \sin x| \geq 2$$

for $x \in [0, 4\pi)$

$$|\sqrt{3}\cos x - \sin x| \leq \sqrt{3+1} = 2 \quad \text{--- (1)}$$

$$|\sqrt{3}\cos x - \sin x| \geq 2 \quad \text{--- (ii)}$$

have (1, 2) $\to$ $|\sqrt{3}\cos x - \sin x| = 2$

$$\left|\frac{\sqrt{3}}{2}\cos x - \frac{1}{2}\sin x\right| = 1$$

$$|\cos \pi/6 \cos x - \sin \pi/6 \sin x| = 1$$

$$\cos(x + \pi/6) = 1$$

$$\cos(x + \pi/6) = -1$$

$$x + \pi/6 = 0, 2\pi, 4\pi, \ldots \; 5\pi, 3\pi$$

$$x = \left\{\frac{11\pi}{6}, \frac{23\pi}{6}, \frac{5\pi}{6}, \frac{17\pi}{6}\right\}$$