



CLASS 10 ACADEMIC PROGRAM-2020

HIGHER MATH

Lecture : HM-25

Chapter 8 : Trigonometry (8.3)

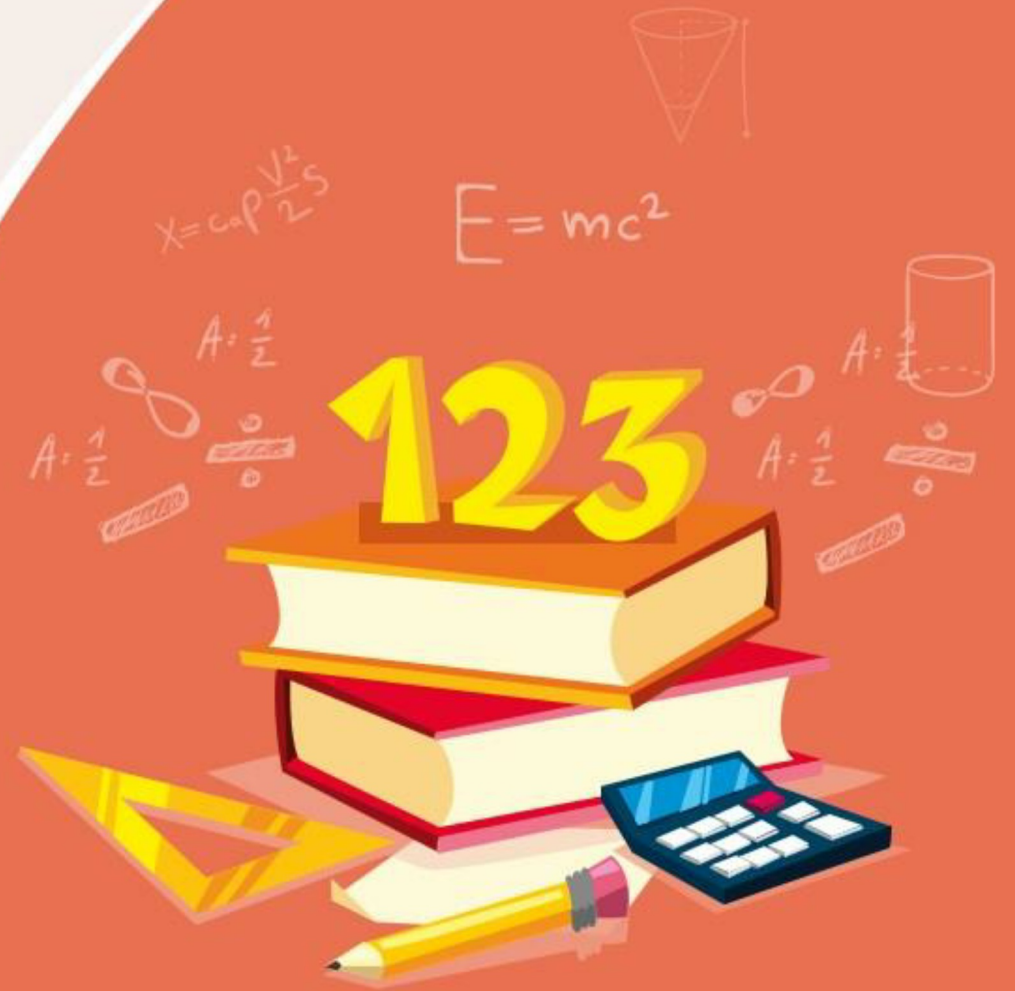


$$x = \sqrt{\frac{a^2}{c} + c} - \frac{b}{2}$$



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Last Class

$$\left(n \frac{\pi}{2} + \theta\right)$$

Odd

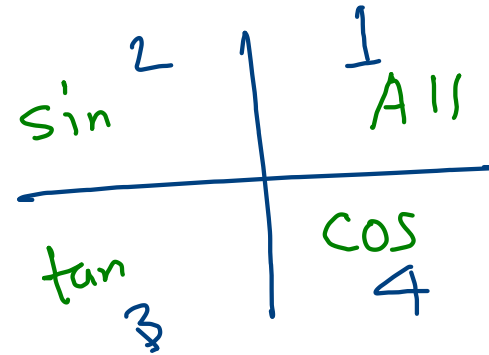
$\sin \leftrightarrow \cos$
 $\tan \leftrightarrow \cot$
 $\sec \leftrightarrow \csc$

Angle

Even

No change

Quadrant determines
the sign



➤ If $\theta = \frac{\pi}{3}$, Prove that, $\sin 2\theta = 2 \sin \theta \cos \theta = \frac{2 \tan \theta}{1 + \tan^2 \theta}$

$$\tan^2 \theta = (\tan \theta)^2$$

$$L.H.S. = \sin 2\theta$$

$$= \sin \left(2 \frac{\pi}{3} \right) \quad (120^\circ)$$

$$= \sin \left(2\pi/2 - \pi/3 \right) \quad 180^\circ - 60^\circ$$

$$= \sin \frac{\pi}{3}$$

$$= \sqrt{3}/2$$

$$\begin{aligned} M.H.S. &= 2 \sin \theta \cos \theta \\ &= 2 \sin \frac{\pi}{3} \cos \frac{\pi}{3} \end{aligned}$$

$$= 2 \times \sqrt{3}/2 \cdot 1/2 = \sqrt{3}/2$$

$$R.H.S. = \frac{2 \tan \theta}{1 + \tan^2 \theta}$$

$$= \frac{2 \tan \frac{\pi}{3}}{1 + \left(\tan \frac{\pi}{3} \right)^2}$$

$$= \frac{2 \cdot \sqrt{3}}{1 + (\sqrt{3})^2} \dots$$

Poll Question-01

□ $\cos\left(\frac{19\pi}{3}\right) = ?$

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

~~(b) $\frac{1}{2}$~~

(c) $\frac{\sqrt{3}}{2}$

(d) $-\frac{\sqrt{3}}{2}$

$$\cos \frac{19\pi}{3}$$

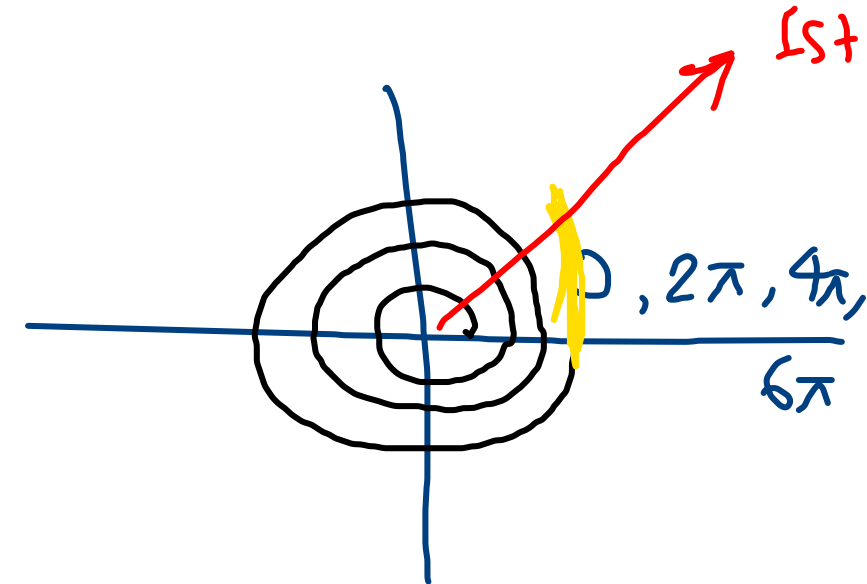
$$\frac{19\pi}{3} = \frac{18\pi + \pi}{3}$$

$$= \cos \left(6\pi + \frac{\pi}{3} \right)$$

$$6\pi = 12 \left(\frac{\pi}{2} \right)$$

$$= + \cos \frac{\pi}{3}$$

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



➤ Show that: $\sin \frac{7\pi}{3} \cos \frac{13\pi}{6} - \cos \frac{5\pi}{3} \sin \frac{11\pi}{6} = 1$

$$2\pi = 4\left(\frac{\pi}{2}\right)$$

$$\text{L.H.S.} = \sin \frac{7\pi}{3} \cos \frac{13\pi}{6} - \cos \frac{5\pi}{3} \sin \frac{11\pi}{6}$$

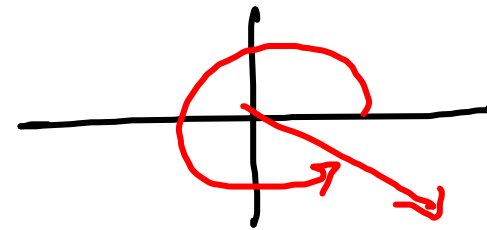
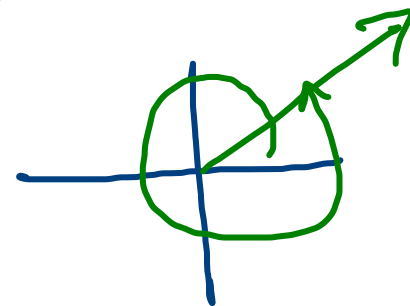
$$= \sin\left(2\pi + \frac{\pi}{3}\right) \cos\left(2\pi + \frac{\pi}{6}\right) - \cos\left(2\pi - \frac{\pi}{3}\right) \sin\left(2\pi - \frac{\pi}{6}\right)$$

$$= \left(+\sin \frac{\pi}{3}\right) \left(+\cos \frac{\pi}{6}\right) - \left(+\cos \frac{\pi}{3}\right) \left(-\sin \frac{\pi}{6}\right)$$

$$= \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{1}{2} \cdot \left(-\frac{1}{2}\right)$$

$=$

$$= 1$$



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Higher Math

Chapter 8 : Trigonometry

➤ Solve: $\sin^2 \frac{17\pi}{18} + \sin^2 \frac{5\pi}{8} + \cos^2 \frac{37\pi}{18} + \cos^2 \frac{3\pi}{8}$

$$\frac{17\pi}{18} = \frac{18\pi - \pi}{18}$$

$$= \left\{ \sin \left(\pi - \frac{\pi}{18} \right) \right\}^2 + \left\{ \sin \left(\pi - \frac{3\pi}{8} \right) \right\}^2 +$$

$$\left\{ \cos \left(2\pi + \frac{\pi}{18} \right) \right\}^2 + \cos^2 \frac{3\pi}{8}$$

$$= \sin^2 \frac{\pi}{18} + \sin^2 \frac{3\pi}{8} + \cos^2 \frac{\pi}{18} + \cos^2 \frac{3\pi}{8}$$

$$= 1 + 1$$

$$= 2$$

$$\sin^2 \theta + \cos^2 \theta = 1$$



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Higher Math

Chapter 8 : Trigonometry

➤ If $\sin \alpha = -\frac{\sqrt{3}}{2}$, Find the Value of α When $\frac{\pi}{2} < \alpha < \frac{3\pi}{2}$

2nd

$$\sin(\pi + \theta) = -\sin \theta$$

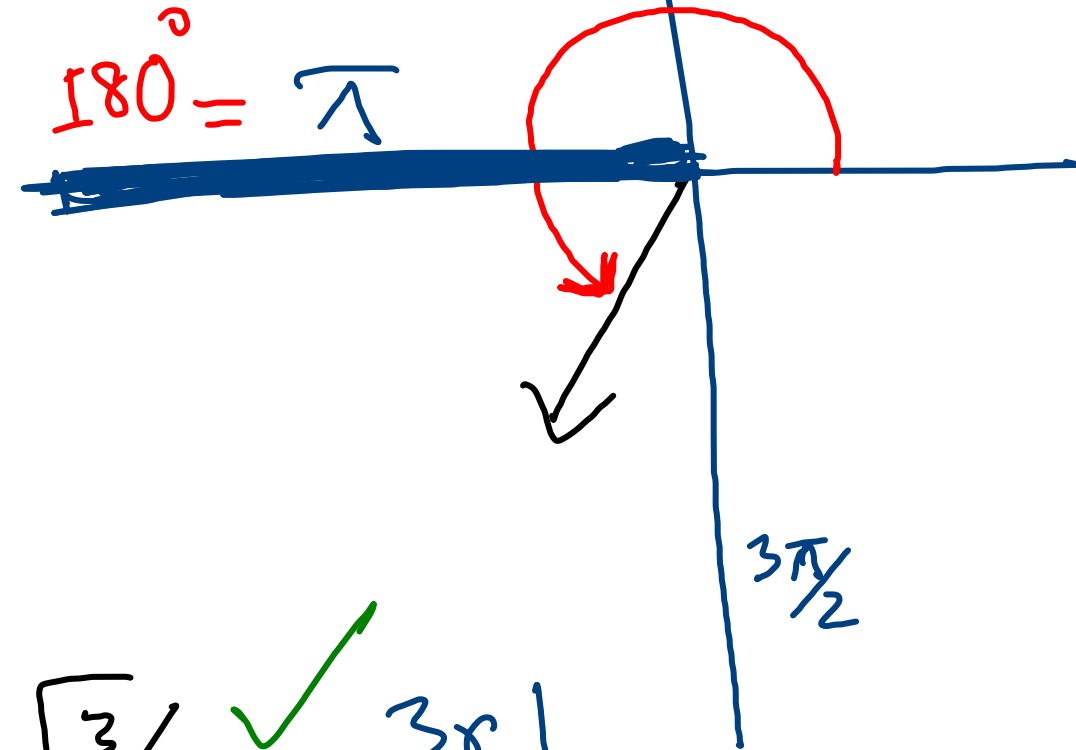
$$\checkmark \sin \alpha = -\sqrt{3}/2 \checkmark$$

$\alpha \rightarrow$ 3rd quad

$$\sin \frac{\pi}{3} = \sqrt{3}/2$$

$$\checkmark \sin\left(\pi + \frac{\pi}{3}\right) = -\sqrt{3}/2 \checkmark \text{ 3rd}$$

$$\checkmark \alpha = \pi + \frac{\pi}{3} = 4\pi/3 \checkmark$$



Poll Question-02

□ $\cos \theta = -\frac{1}{2}$, $\theta = ?$

(a) $0 < \theta < 90$

✓ (b) $90 < \theta < 180$

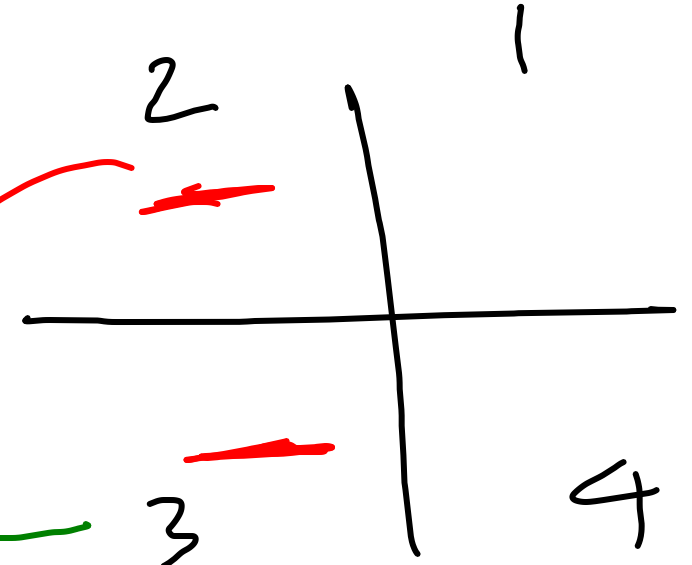
✓ (c) $180 < \theta < 270$

~~(d) b & c~~

$\cos \theta = -\frac{1}{2}$

✓ $90 < \theta < 180$

✓ $180 < \theta < 270$



$\cos \theta = -\frac{1}{2}$

$= \cos\left(\pi - \frac{\pi}{3}\right)$

$\cos\left(\pi + \frac{\pi}{3}\right)$

$\cos \frac{\pi}{3} = \frac{1}{2}$

➤ Solve: $4(\cos^2 \theta + \sin \theta) = 5$; [When $0 < \theta < 2\pi$] $\rightarrow$ 4 quad

$$4(1 - \sin^2 \theta + \sin \theta) = 5$$

$$4 - 4\sin^2 \theta + 4\sin \theta = 5$$

$$\text{or, } 4\sin^2 \theta - 4\sin \theta + 1 = 0$$

$$\text{or, } (2\sin \theta - 1)^2 = 0$$

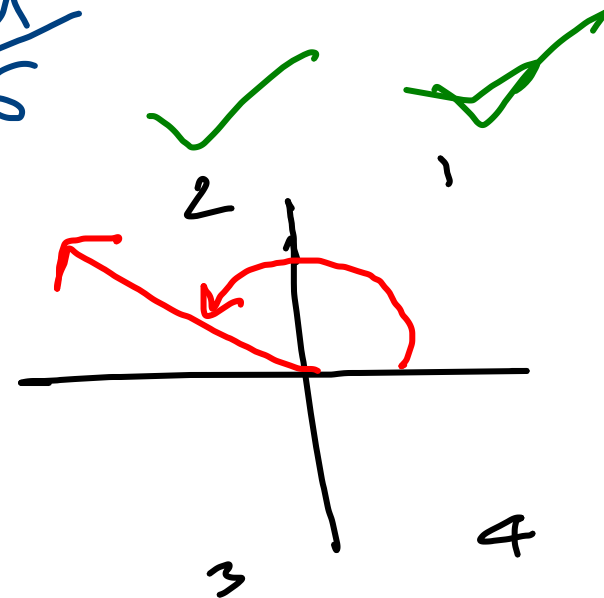
$$\text{or, } 2\sin \theta - 1 = 0$$

$$\therefore \sin \theta = \frac{1}{2}$$

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

$$= \sin \frac{\pi}{6}, \sin\left(\pi - \frac{\pi}{6}\right)$$

$$\theta = \frac{\pi}{6}, \frac{5\pi}{6}$$



Poll Question-03

□ If $\sin \theta - \cos \theta = 0$; [when $0 < \theta < \frac{\pi}{2}$] then $\theta = ?$

1st quad

(a) 0

(b) $\frac{\pi}{2}$

(c) Undefined

~~(d) $\frac{\pi}{4}$~~

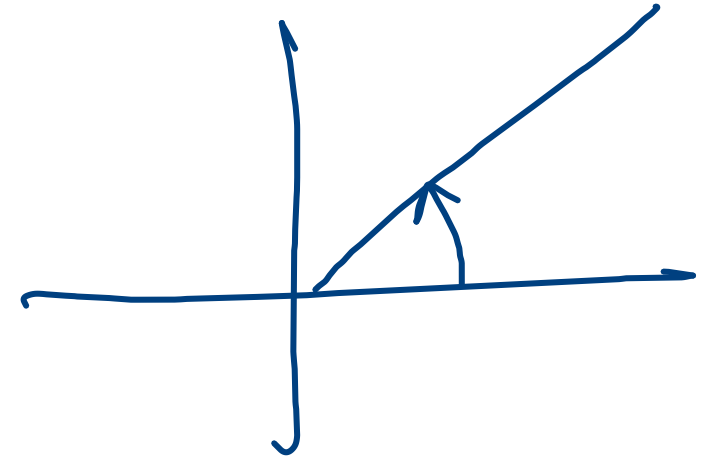
$$\sin \theta = \cos \theta$$

$$\frac{\sin \theta}{\cos \theta} = 1$$

$$\tan \theta = 1$$

$$= \tan \frac{\pi}{4}$$

$$\theta = \frac{\pi}{4}$$



➤ Solve: $\tan \theta + \cot \theta = \frac{4}{\sqrt{3}}$; [When $0 < \theta < \frac{\pi}{2}$] $\rightarrow$ 1st quad

$$\tan \theta + \frac{1}{\tan \theta} = \frac{4}{\sqrt{3}}$$

$$\frac{\tan^2 \theta + 1}{\tan \theta} = \frac{4}{\sqrt{3}}$$

$$\sqrt{3}(\tan^2 \theta + 1) = 4 \tan \theta$$

$$\sqrt{3} \tan^2 \theta - 4 \tan \theta + \sqrt{3} = 0$$

$$\tan \theta = \sqrt{3}, \frac{1}{\sqrt{3}}$$

$$\tan \theta = \sqrt{3}$$

$$\therefore \theta = \pi/3$$

$$\tan \theta = \frac{1}{\sqrt{3}}$$

$$\therefore \theta = \pi/6$$

➤ Solve: $\sec^2 \theta + \tan^2 \theta = \frac{5}{3}$; When $0 < \theta < 2\pi$ $\rightarrow$ 4 quad

$$\downarrow$$
$$1 + \tan^2 \theta + \tan^2 \theta = \frac{5}{3}$$

$$1 + 2\tan^2 \theta = \frac{5}{3}$$

$$3(1 + 2\tan^2 \theta) = 5$$

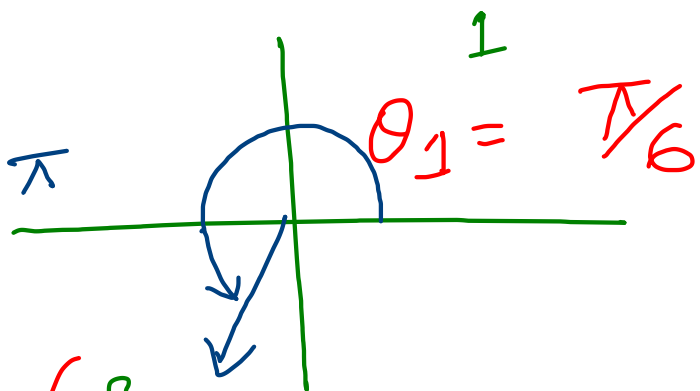
$$3 + 6\tan^2 \theta = 5$$

$$6\tan^2 \theta = 5 - 3$$

$$\tan^2 \theta = \frac{2}{6}$$

$$\tan \theta = \pm \frac{1}{\sqrt{3}}$$

$$\tan \theta = \frac{1}{\sqrt{3}}$$

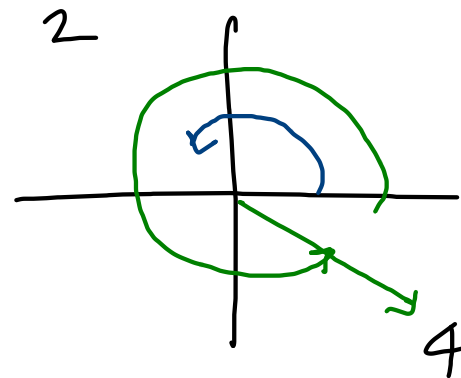


$$\theta_3 = \pi + \frac{\pi}{6}$$

$$\theta = \frac{\pi}{6}, \frac{7\pi}{6}, \frac{5\pi}{6}, \frac{11\pi}{6}$$

$$\tan \frac{\pi}{6} = \frac{1}{\sqrt{3}}$$

$$\tan \theta = -\frac{1}{\sqrt{3}}$$



$$\theta_2 = \pi - \frac{\pi}{6}$$

$$\theta_4 = 2\pi - \frac{\pi}{6}$$

➤ Solve: $2 \sin x \cos x = \sin x$; [When $0 \leq x \leq 2\pi$]

$$2 \sin x \cos x - \sin x = 0$$

$$\sin x (2 \cos x - 1) = 0$$

either
 $\sin x = 0$

or

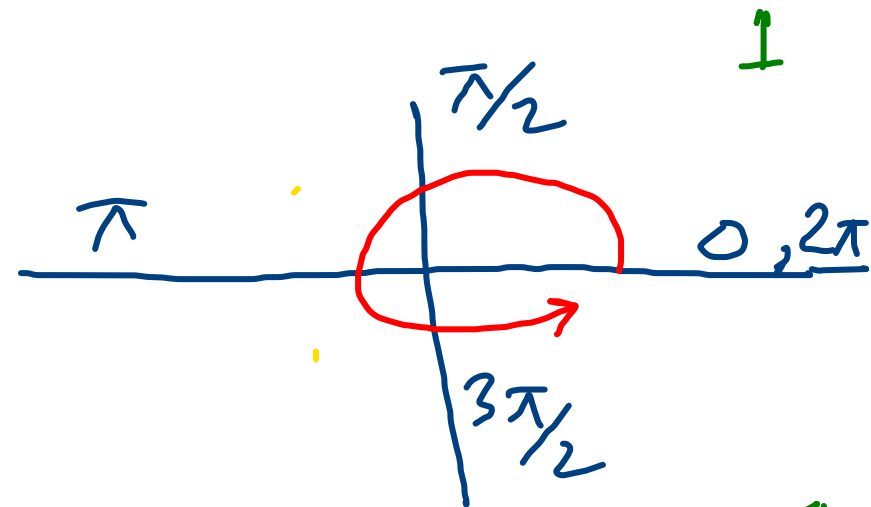
$$2 \cos x - 1 = 0$$

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

$$\sin x = 0$$

$$= \sin(0), \sin(\pi), \sin(2\pi)$$

$$x = 0, \pi, 2\pi$$



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

$$= \cos\left(\frac{\pi}{3}\right), \cos\left(2\pi - \frac{\pi}{3}\right)$$

$$x = \frac{\pi}{3}, \frac{5\pi}{3}$$

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

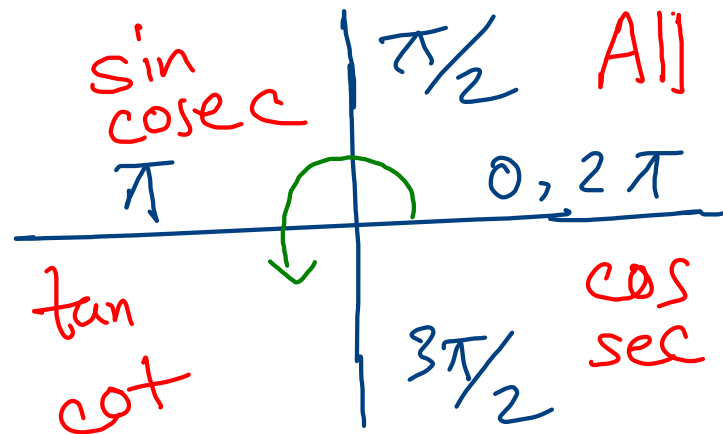
$$= \sin(2\pi/2 + \theta)$$

$$= \sin \theta$$

$$\sin^2(5\pi/4)$$

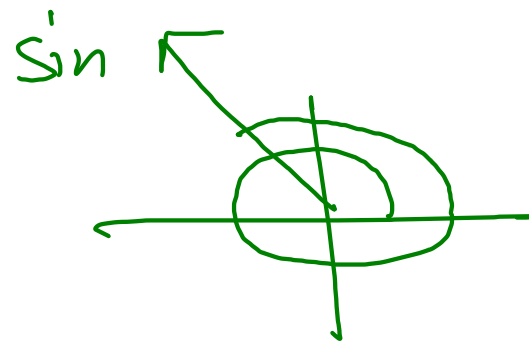
$$= \sin^2(\pi + \pi/4)$$

$$= \sin^2 \pi/4$$



$$\sin(5\pi/2 + \theta)$$

$$= + \cos \theta$$



$$\cos(2\pi - \pi/3)$$

$$= + \cos \pi/3$$

$$\sin^2 \frac{7\pi}{4}$$

$$= \sin^2(2\pi - \pi/4) = \sin^2 \pi/4 = 1/2$$

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$$X = \frac{c \cdot p \cdot \sqrt{2}}{2 \cdot S}$$

$$X = \frac{c \cdot p \cdot \sqrt{2}}{2 \cdot S}$$

$$E = mc^2$$

$$x = \sqrt{\frac{a^2}{c} + c} - \frac{b}{2}$$



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