

6.7/6.8 - Solving Trig Equations

Old Stuff

which angles are solutions?

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

a) $\theta = \frac{\pi}{3}$

c) $\frac{5\pi}{3}$

b) $\theta = \frac{2\pi}{3}$

d) $\frac{7\pi}{3}$

$$|+x = \frac{1}{2}$$

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

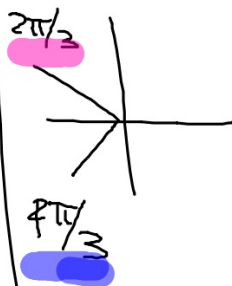
$$\cos x = -\frac{1}{2}$$

For General Solution:

$$\theta = \frac{2\pi}{3} + 2k\pi, k \in \mathbb{Z}$$

$$\theta = \frac{4\pi}{3} + 2k\pi, k \in \mathbb{Z}$$

for $0 \leq x < 2\pi$



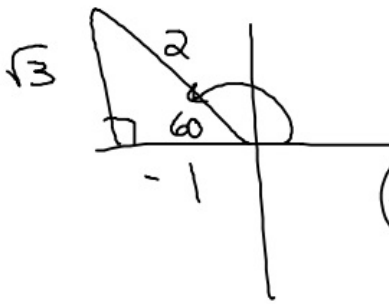
$$\theta = \frac{2\pi}{3}, \frac{4\pi}{3}$$

$$\sqrt{3}x + 1 = 0$$

$$\sqrt{3}x = -1$$

$$x = \frac{-1}{\sqrt{3}}$$

$$x = \frac{-\sqrt{3}}{3}$$



For $0 \leq x < 2\pi$, solve:

$$\sqrt{3} \cot x + 1 = 0$$

$$\sqrt{3} \cot x = -1$$

$$\cot x = \frac{-1}{\sqrt{3}}$$

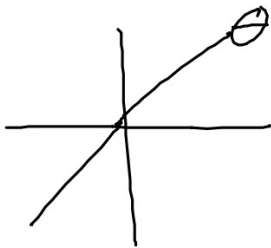
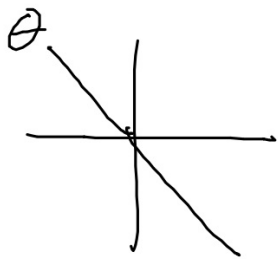
$$\tan x = -\sqrt{3}$$

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

$$\boxed{\text{General Solution}} \quad x = \frac{2\pi}{3} + k\pi, \quad k \in \mathbb{Z}$$

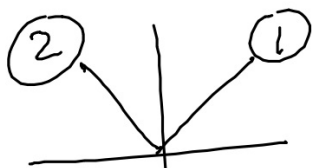
* Since the angles are π apart





$$\theta + K\pi, K \in \mathbb{Z}$$

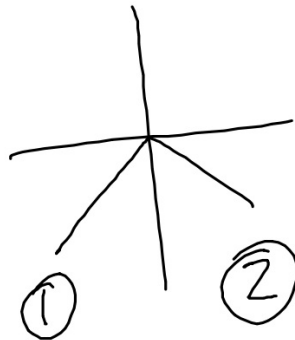
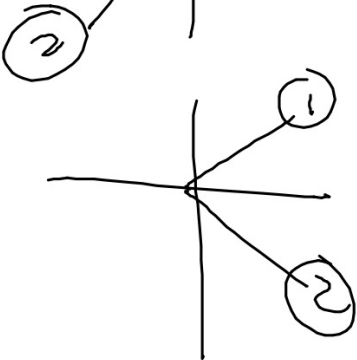
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$$\textcircled{1} + 2k\pi, k \in \mathbb{Z}$$



$$\textcircled{2} + 2k\pi, k \in \mathbb{Z}$$



$$4x^2 - 3 = 0$$

$$4x^2 = 3$$

$$x^2 = \frac{3}{4}$$

$$x = \pm \sqrt{\frac{3}{4}}$$

$$x = \pm \frac{\sqrt{3}}{2}$$

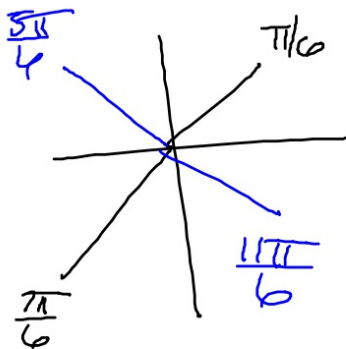
$$4\cos^2 x - 3 = 0$$

$$4\cos^2 x = 3$$

$$\cos^2 x = \frac{3}{4}$$

$$\cos x = \pm \sqrt{\frac{3}{4}}$$

$$\cos x = \pm \frac{\sqrt{3}}{2}$$



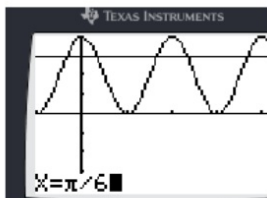
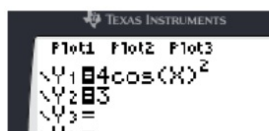
For $0 \leq x < 2\pi$

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

General Solution

$$x = \frac{\pi}{6} + k\pi, k \in \mathbb{Z}$$

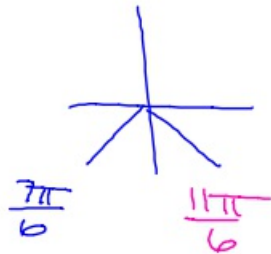
$$x = \frac{5\pi}{6} + k\pi, k \in \mathbb{Z}$$



$$\sin(5x) = -\frac{1}{2}$$

Solve for $x < 2\pi$

- ① Where is $\sin \theta = -\frac{1}{2}$ ② Set ~~to~~ = to values from step 1



general

$$S_x = \frac{7\pi}{6} + 2k\pi, k \in \mathbb{Z}$$

$$x = \frac{7\pi}{30} + \frac{2k\pi}{5}, k \in \mathbb{Z}$$

$$x = \frac{7\pi}{30} + \frac{12k\pi}{30}, k \in \mathbb{Z}$$

$$k=0 \quad \frac{7\pi}{30} + \frac{12(0)\pi}{30} = \frac{7\pi}{30}$$

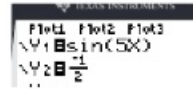
$$k=1 \quad \frac{7\pi}{30} + \frac{12(1)\pi}{30} = \frac{19\pi}{30}$$

$$k=2 \quad \frac{7\pi}{30} + \frac{12(2)\pi}{30} = \frac{31\pi}{30}$$

$$k=3 \quad = \frac{43\pi}{30}$$

$$k=4 \quad = \frac{55\pi}{30}$$

12π apart!



10 Solutions !!



Khol's Technique

Since $\frac{11\pi}{6} - \frac{7\pi}{6} = \frac{4\pi}{6} \rightarrow \frac{4\pi}{30}$ since $S_x = \frac{4\pi}{6}$
 $X = \frac{4\pi}{30}$

Take each value and add $\frac{4\pi}{30} \dots$

$$S_x = \frac{11\pi}{6} + 2k\pi, k \in \mathbb{Z}$$

$$x = \frac{11\pi}{30} + \frac{2k\pi}{5}, k \in \mathbb{Z}$$

other gen. formula

Solve $0 \leq x < 2\pi$

① $2\cos^2 x - 3\cos x + 1 = 0$

② $\sqrt{3} \tan^2 x + \tan x = 0$

③ $3\cos x + 3 = 2\sin^2 x$

④ $\cos^2 x + \sin x = 0$

} Hint:
Factor

} Hint:
TRIG ID.