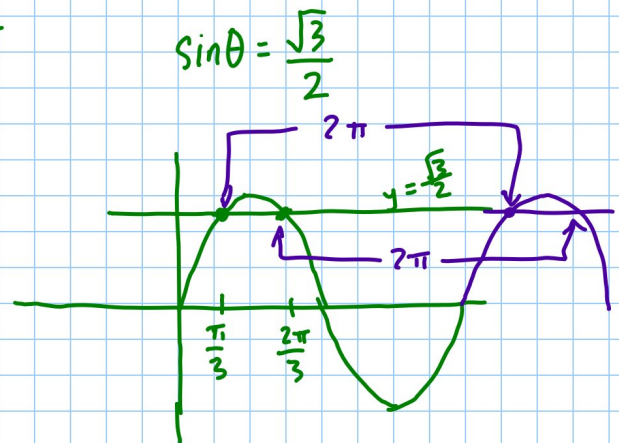


Section 6.7 Solving Trig Functions

An equation such as $\sin\theta = \frac{\sqrt{3}}{2}$ is asking for what angles does the sine equal $\frac{\sqrt{3}}{2}$.

ex: Solve the equation for $0 \leq \theta < 2\pi$
radians

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



If we were asked to give general solution (or solve for all real numbers)

$$\theta = \frac{\pi}{3} + 2\pi k \quad (k \text{ is any integer})$$

$$\theta = \frac{2\pi}{3} + 2\pi k$$

ex: Solve $2\cos\theta = -1$. Give general solutions.

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

$$\theta = \frac{2\pi}{3} + 2\pi k$$

$$\theta = \frac{4\pi}{3} + 2\pi k$$

ex: Solve. $\tan\theta = -1$. Give general solutions.

$$\theta = \frac{3\pi}{4} + \pi k$$

$$\theta = \frac{7\pi}{4} + \pi k$$

} stating both answers is redundant

So our answer is

$$\frac{3\pi}{4} + \pi k$$

Period for tangent is π .
 $\frac{3\pi}{4} + \pi \cdot 1 = \frac{3\pi}{4} + \frac{4\pi}{4} = \frac{7\pi}{4}$

ex: Find solutions for $2\cos\theta + \sqrt{2} = 0$

$$2\cos\theta = -\sqrt{2}$$

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

$$\theta = \frac{3\pi}{4} + 2\pi k$$

$$\theta = \frac{5\pi}{4} + 2\pi k$$

ex: $\cos(2\theta) = \frac{1}{2}$

$$\frac{1}{2}(2\theta) = \left(\frac{\pi}{3} + 2\pi k\right) \frac{1}{2}$$

$$\frac{1}{2}(2\theta) = \left(\frac{5\pi}{3} + 2\pi k\right) \frac{1}{2}$$

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

$$X = \frac{\pi}{3} + 2\pi k$$

$$X = \frac{5\pi}{3} + 2\pi k$$

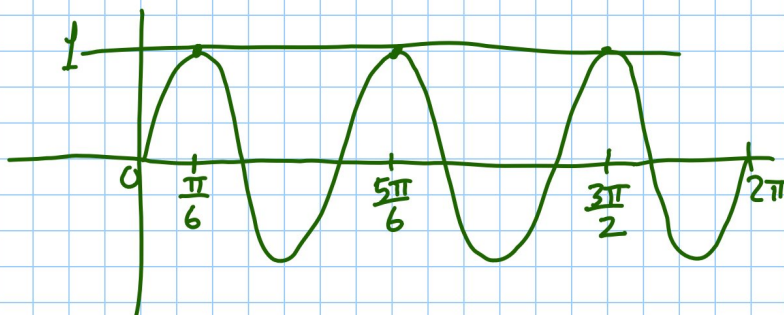
$$\theta = \frac{\pi}{6} + \pi k$$

$$\theta = \frac{5\pi}{6} + \pi k$$

ex: $\sin(3\theta) = 1$ Find all solution on $[0, 2\pi)$

$$\frac{1}{3}(3\theta) = \left(\frac{\pi}{2} + 2\pi k\right) \frac{1}{3}$$

$$\theta = \frac{\pi}{6} + \frac{2\pi k}{3}$$



$$k=0: \frac{\pi}{6} + \frac{2\pi \cdot 0}{3} = \frac{\pi}{6}$$

$$k=1: \frac{\pi}{6} + \frac{2\pi \cdot 1}{3} = \frac{\pi}{6} + \frac{2\pi}{3} = \frac{\pi}{6} + \frac{4\pi}{6} = \frac{5\pi}{6}$$

$$k=2: \frac{\pi}{6} + \frac{2\pi \cdot 2}{3} = \frac{\pi}{6} + \frac{4\pi}{3} = \frac{\pi}{6} + \frac{8\pi}{6} = \frac{9\pi}{6} = \frac{3\pi}{2}$$

$$\left[\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2} \right]$$

HW For 1-5, find general formula
($+2\pi k$ or $+\pi k$)

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

$$2) 3\sin \theta + 3 = 0$$

$$3) 2\sec \theta = 4$$

$$4) 2\sin \theta + 1 = 0$$

$$5) \cot \theta = \sqrt{3}$$

In 6-10, find all solutions on $[0, 2\pi)$

$$6) 2\sin \theta + 3 = 2$$

$$7) \sin(2\theta) = \frac{\sqrt{3}}{2}$$

$$8) \cos^2 \theta = \frac{1}{4}$$

$$9) \tan \frac{\theta}{2} = \sqrt{3}$$

$$10) \sin\left(\theta + \frac{\pi}{2}\right) = \frac{1}{2}$$