

Solving Cosine Equations

Goal:

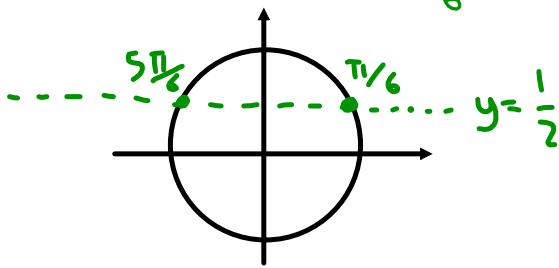
- to solve cosine equations

Solving a cosine equation is essentially the same as solving a sine equation. The major difference is remembering that the sine of an angle corresponds to the y-coord of a trig point, while the cosine of an angle corresponds to the x-coord of a trig point.

$$\sin x = 1/2$$

$$x = \sin^{-1}\left(\frac{1}{2}\right)$$

$$x_1 = \frac{\pi}{6} \quad x_2 = \frac{5\pi}{6}$$

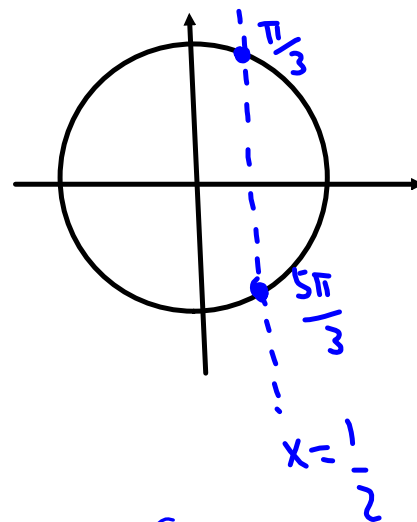


$$x = \left\{ \frac{\pi}{6} + 2\pi n, \frac{5\pi}{6} + 2\pi n; n \in \mathbb{Z} \right\}$$

$$\cos x = 1/2$$

$$x = \cos^{-1}\left(\frac{1}{2}\right)$$

$$x_1 = \frac{\pi}{3} \quad x_2 = \frac{5\pi}{3}$$



$$x = \left\{ \frac{\pi}{3} + 2\pi n, \frac{5\pi}{3} + 2\pi n; n \in \mathbb{Z} \right\}$$

* To find 2nd angle
after \cos^{-1}

$$2\pi - \theta_1$$

$$a) 2 \cos t = -\sqrt{3}$$

$$\cos t = -\frac{\sqrt{3}}{2}$$

$$t = \cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$$

$$t = \left\{ \frac{5\pi}{6} + 2\pi n, \frac{7\pi}{6} + 2\pi n; n \in \mathbb{Z} \right\}$$

$$b) \frac{1}{2} \cos\left(\frac{\pi}{4}x - \frac{\pi}{4}\right) - \frac{\sqrt{2}}{4} = 0$$

$$\frac{1}{2} \cos\left(\frac{\pi}{4}x - \frac{\pi}{4}\right) = \frac{\sqrt{2}}{4}$$

$$\cos\left(\frac{\pi}{4}x - \frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$$

$$\frac{\pi}{4}x - \frac{\pi}{4} = \cos^{-1}\left(\frac{\sqrt{2}}{2}\right)$$

$$\frac{\pi}{4}x - \frac{\pi}{4} = \frac{\pi}{4} + 2\pi n$$

$$\frac{\pi}{4}x = \frac{\pi}{2} + 2\pi n$$

$$x = 2 + 8n$$

$$\frac{\pi}{4}x - \frac{\pi}{4} = \frac{7\pi}{4} + 2\pi n$$

$$\frac{\pi}{4}x = 2\pi + 2\pi n$$

$$x = 8 + 8n$$

$$x = \left\{ 2 + 8n, 8 + 8n; n \in \mathbb{Z} \right\}$$

$$c) -8 \cos 2 \left(x - \frac{\pi}{4} \right) + 3 = -2$$

$$-8 \cos 2 \left(x - \frac{\pi}{4} \right) = -5$$

$$\cos 2 \left(x - \frac{\pi}{4} \right) = \frac{5}{8}$$

$$2 \left(x - \frac{\pi}{4} \right) = \cos^{-1} \left(\frac{5}{8} \right)$$

$$2 \left(x - \frac{\pi}{4} \right) = 0.896 + 2\pi n$$

$$x - \frac{\pi}{4} = 0.448 + \pi n$$

$$x = 1.233 + \pi n$$

$$2\pi - 0.896$$



$$2 \left(x - \frac{\pi}{4} \right) = \underline{5.387} + 2\pi n$$

$$x - \frac{\pi}{4} = 2.6935 + \pi n$$

$$x = 3.479 + \pi n$$

$$x = \left\{ 1.233 + \pi n, 3.479 + \pi n; n \in \mathbb{Z} \right\}$$