

5.4 Solving Trig Equations

Ex1) Solve $2\cos^2x - 1 = 0$, $0^\circ \leq x \leq 360^\circ$.

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

$$\begin{aligned}\cos x &= \pm \sqrt{\frac{1}{2}} \\ &= \pm \frac{\sqrt{1}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} \\ &= \pm \frac{\sqrt{2}}{2}\end{aligned}$$

$$x = 45^\circ, 135^\circ, 225^\circ, 315^\circ$$

Ex2) Solve $\underset{-13}{16} = 6 \cos\left(\frac{\pi}{6}x\right) + \underset{-13}{13}$ for all x .

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

$$\frac{1}{2} = \cos\left(\frac{\pi}{6}x\right) \quad \text{Think } \frac{\pi}{6}x = \theta$$

$$\cancel{\frac{6}{\pi}} \cdot \frac{\pi}{6} x = \frac{\pi}{3} \cdot \cancel{\frac{6}{\pi}} \quad \cancel{\frac{6}{\pi}} \cdot \frac{\pi}{6} x = \frac{5\pi}{3} \cdot \cancel{\frac{6}{\pi}}$$

$$x = 2$$

$$x = 10$$

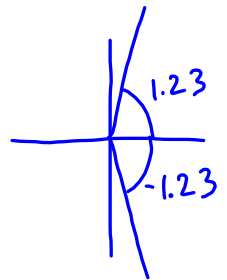
$$\text{per} = \frac{2\pi}{b} = \frac{2\pi}{\frac{\pi}{6}} = 12 \quad x = \begin{cases} 2 + 12n, n \in \mathbb{Z} \\ 10 + 12n, n \in \mathbb{Z} \end{cases}$$

$$b = \frac{2\pi}{\text{per}}$$

Ex3) Solve $16 = 6 \cos\left(\frac{\pi}{6}x\right) + 14$, for all x .

$$\frac{1}{3} = \cos\left(\frac{\pi}{6}x\right)$$

$$2^{\text{nd}} \cos\left(\frac{1}{3}\right) = 1.23\dots$$



$$\frac{6}{\pi} \cdot \frac{\pi}{6} x = 1.23 \cdot \frac{6}{\pi}$$

$$= 2.35\dots$$

$$\frac{\pi}{6} x = 2\pi - 1.23\dots$$

$$\frac{6}{\pi} \cdot \frac{\pi}{6} x = 5.05 \cdot \frac{6}{\pi}$$

$$= 9.65\dots$$

$$x = \begin{cases} 2.35 + 12n, n \in \mathbb{Z} \\ 9.65 + 12n, n \in \mathbb{Z} \end{cases} \quad \text{Check by graphing.}$$

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