

# Solving Trigonometric Equations

## 14.6

Find all of the solutions of  $3\tan\theta = \tan\theta + 2$ .

$3\tan\theta = \tan\theta + 2$	Given
$3\tan\theta - \tan\theta = 2$	Subtract $\tan\theta$
$2\tan\theta = 2$	Combine like terms
$\tan\theta = 1$	Divide by 2
$\theta = \tan^{-1} 1$ $\theta = 45^\circ$	Solve using $\tan^{-1}$
$\theta = 45^\circ + 180^\circ n$	Add the period of the tan function.

We Try:

Find all of the solutions of  $2\cos\theta + \sqrt{3} = 0$

$2\cos\theta + \sqrt{3} = 0$	

Solve each equation for the given domain.

$$\sin^2 \theta - 2\sin\theta = 3 \quad \text{for } 0 \leq \theta \leq 2\pi$$

$\sin^2 \theta - 2\sin\theta = 3$	Given
$\sin^2 \theta - 2\sin\theta - 3 = 0$	Subtract 3
$(\sin\theta - 3)(\sin\theta + 1) = 0$	Factor
$(\sin\theta - 3) = 0$ $(\sin\theta + 1) = 0$ $(\sin\theta = 3)$ $(\sin\theta = -1)$ <b>No Solution</b> $\theta = \frac{3\pi}{2}$	Solve for each.
$\theta = \frac{3\pi}{2}$	

We Try:

$$\sin^2 \theta - \sin\theta = 0$$

$\sin^2 \theta - \sin\theta = 0$	



I Try:

Use Trigonometric identities to solve each equation.

$$0 \leq \theta \leq 2\pi$$

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

$2 \cos^2 \theta = \sin \theta + 1$	Given
$2(1 - \sin^2 \theta) = \sin \theta + 1$	Pythagorean Identity
$2 - 2 \sin^2 \theta = \sin \theta + 1$	Distribute
$0 = 2 \sin^2 \theta + \sin \theta - 1$	Move to one side.
$0 = (\sin \theta + 1)(2 \sin \theta - 1)$	Factor
$0 = (\sin \theta + 1) \quad (2 \sin \theta - 1)$ $(\sin \theta = -1) \quad (2 \sin \theta = 1)$ $(\theta = \sin^{-1}(-1)) \quad (\sin \theta = \frac{1}{2})$ $\theta = \frac{3\pi}{2} \text{ or } \theta = \frac{\pi}{6} \text{ or } \frac{5\pi}{6}$  $\theta = \frac{3\pi}{2}, \frac{\pi}{6}, \text{ or } \frac{5\pi}{6}$	Solve for each

We Try:

$$\cos 2\theta + 3\cos\theta + 2 = 0$$


Closure:

Exit Slip

Solve with your partner on a half piece of paper.

$$\cos 2\theta + 3\cos\theta + 2 = 0$$