

## Teacher Notes- 5.3 Solving Equations Using Trig Identities Day 2

Solve each equation in the indicated domain:  $[0, 2\pi)$

When the period is changed, we will get even more answers.

1. The 3 is going to give you 3 times as many answers, so, you will have 6 (This is a good general rule, but be careful.)!

$$\sin(3x) = -\frac{\sqrt{3}}{2}$$

$$\begin{array}{lcl} 3x = \frac{5\pi}{3} & & 3x = \frac{4\pi}{3} \\ x = \frac{5\pi}{9} & \text{or} & x = \frac{4\pi}{9} \end{array}$$

Add and subtract  $2\pi/3$  (because this is the new period and we want coterminal angles) from the original answers to get the remaining 4.

$$x = \frac{4\pi}{9}, \frac{5\pi}{9}, \frac{10\pi}{9}, \frac{11\pi}{9}, \frac{16\pi}{9}, \frac{17\pi}{9}$$

$$2. 2 \cos 2t - 1 = 0$$

$$2 \cos(2t) - 1 = 0$$

$$2 \cos(2t) = 1$$

$$\cos(2t) = \frac{1}{2}$$

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

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

$$t = \frac{\pi}{6}, \frac{5\pi}{6}$$

Since the period is now  $\frac{2\pi}{2}$  or  $\pi$ , add  $\pi$  until you get all 4 answers!

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

$$3. \tan \frac{x}{2} - 1 = 0$$

$$\tan \frac{x}{2} - 1 = 0$$

$$\tan \frac{x}{2} = 1$$

$$\frac{x}{2} = \tan^{-1}(1)$$

$$\frac{x}{2} = \frac{\pi}{4}, \frac{5\pi}{4}$$

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

$\frac{5\pi}{2}$  is bigger than  $2\pi$ , so  $x = \frac{\pi}{2}$  is our only answer.