

4.7 - Trigonometric Equations - Day 2

Now we will concentrate on finding solutions of trigonometric equations for $0 \leq x < 2\pi$. You can use a graphing utility to check the solutions of these equations. Graph the left side and graph the right side. The solutions are the x -coordinates of the points where the graphs intersect.

HW Day2: 4.7:
p. 674: 25 - 37 odds

EXAMPLE 2 Solving an Equation with a Multiple Angle

Solve the equation: $\sin \frac{x}{2} = \frac{\sqrt{3}}{2}, 0 \leq x < 2\pi$

"where does the y -val. equal $\frac{\sqrt{3}}{2}$?"
solution generators:

$x = \frac{2\pi}{3} + 4\pi n$
 $x = \frac{4\pi}{3} + 4\pi n$

$\frac{x}{2} = \left(\frac{\pi}{3} + 2\pi n\right) \cdot 2$
 $\frac{x}{2} = \left(\frac{2\pi}{3} + 2\pi n\right) \cdot 2$

$n=0$: $x = \frac{2\pi}{3}, x = \frac{4\pi}{3}$

$n=1$: $x = \frac{2\pi}{3} + 4\pi$
exceeds 2π !

Check Point 2 Solve the equation: $0 \leq x < 2\pi$.

$\cos 2x = \frac{\sqrt{2}}{2}$ $2x = \left(\frac{\pi}{4} + 2\pi n\right) \cdot \frac{1}{2}$, $x = \frac{\pi}{8} + \pi n$
 $2x = \left(\frac{7\pi}{4} + 2\pi n\right) \cdot \frac{1}{2}$, $x = \frac{7\pi}{8} + \pi n$

$n=0$: $x = \frac{\pi}{8}, \frac{7\pi}{8}$

$n=1$: $x = \frac{\pi}{8} + \frac{8\pi}{8} = \frac{9\pi}{8}$, $x = \frac{7\pi}{8} + \frac{8\pi}{8} = \frac{15\pi}{8}$

$n=2$: $x = \frac{\pi}{8} + \frac{16\pi}{8}$

STOP!

EXAMPLE 3 Solving an Equation with a Multiple AngleSolve the equation: $\tan(3x) = 1$, $0 \leq x < 2\pi$.

$$3x = \left(\frac{\pi}{4} + \pi n \right) \frac{1}{3} \rightarrow x = \frac{\pi}{12} + \frac{\pi n}{3}$$

Solution Generator!

$$n=0: \boxed{\frac{\pi}{12}} \quad n=1: x = \frac{\pi}{12} + \frac{\pi}{3} \left(\frac{4}{4} \right) = \boxed{\frac{5\pi}{12}}$$

$$n=2: x = \frac{\pi}{12} + \frac{2\pi}{3} \left(\frac{4}{4} \right) = \frac{9\pi}{12} \rightarrow \boxed{\frac{3\pi}{4}}$$

$$n=3: x = \frac{\pi}{12} + \frac{3\pi}{3} \left(\frac{4}{4} \right) = \boxed{\frac{13\pi}{12}}$$

$$n=5: x = \frac{\pi}{12} + \frac{5\pi}{3} \left(\frac{4}{4} \right) = \frac{21\pi}{12}$$

$$n=4: x = \frac{\pi}{12} + \frac{4\pi}{3} \left(\frac{4}{4} \right) = \boxed{\frac{17\pi}{12}}$$

$$n=6: x = \frac{\pi}{12} + \frac{6\pi}{3} \text{ STOP!}$$

$$\boxed{\frac{7\pi}{4}}$$