Ch 5-4 Solving Trig equations Day 2

Solve The following for the given interval:

A) $2\csc^2\theta - 8 = 0$ $\theta \in R$ (radians)

$2\csc^2\theta = 8$

$\sqrt{\csc^2\theta} = \sqrt{4}$

$\csc\theta = \pm 2$

$\csc\theta = 2$ $\csc\theta = -2$

$\frac{1}{\sin\theta} = 2$ $\frac{1}{\sin\theta} = -2$

$\sin\theta = \frac{1}{2}$ $\sin\theta = -\frac{1}{2}$

$\theta = \begin{matrix} \pi/6 \\ 5\pi/6 \end{matrix} \pm 2\pi K, K \in I$ $\theta = \begin{matrix} 7\pi/6 \\ \frac{11\pi}{6} \end{matrix} \pm 2\pi K, K \in I$

$\theta = \begin{cases} \pi/6 \\ 5\pi/6 \\ 7\pi/6 \\ 11\pi/6 \end{cases} \pm 2\pi K, K \in I$

B) $2\sec^2\theta = 1 - \sec\theta$ $\theta \in R$ (radians)

all solutions

$2\sec^2\theta + \sec\theta - 1 = 0$

let $m = \sec\theta$

$2m^2 + m - 1 = 0$

$(2m-1)(m+1) = 0$

$2m - 1 = 0$ $\quad$ $m + 1 = 0$

$m = 1/2$ $\quad$ $m = -1$

$\sec\theta = 1/2$ $\quad$ $\sec\theta = -1$

$\frac{1}{\cos\theta} = 1/2$ $\quad$ $\frac{1}{\cos\theta} = -1$

$\cos\theta = 2$ $\quad$ $\cos\theta = -1$

$\cos\theta = 2$

never

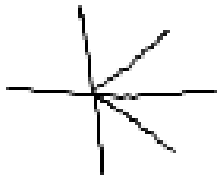
$\cos\theta = -1$

$\theta = \pi$

$\theta = \pi \pm 2\pi k, k \in I$

C) $\cos 2x = 0.8179$ $\quad 0° < x < 360°$ * Calc in Degrees!

let $m = 2x$

$\cos m = 0.8179$ →  cos is + in QI and QIV

$m = \cos^{-1}(0.8179)$

$m = 35.12°$ (QI) $\quad$ QIV: $360° - 35.12° = 324.88°$

$$\frac{2x}{2} = \begin{cases} 35.12° \div 2 \\ 324.88° \div 2 \end{cases} \pm 360° K,\ K \in I \quad \div 2$$

$$x = \begin{cases} 17.56° \\ 162.44° \end{cases} \pm 180° K, K \in I$$

$$x = \{17.56°, 162.44°, 197.56°, 342.44°\}$$

D) $6\cos\left[2\left(x-\frac{\pi}{6}\right)\right]-1=2$

$[-\pi, 5\pi) \rightarrow \frac{15\pi}{3}$

let $m = 2(x-\frac{\pi}{6})$

$6\cos m - 1 = 2$

$6\cos m = 3$

$\cos m = \frac{1}{2}$

$m = \begin{cases} \pi/3 \\ 5\pi/3 \end{cases} \pm 2\pi k, k \in I$

$2(x-\pi/6) = \begin{cases} \pi/3 \div 2 \\ 5\pi/3 \div 2 \end{cases} \pm 2\pi k, k \in I$

$\div 2$

$x - \pi/6 = \begin{cases} \pi/6 \\ 5\pi/6 \end{cases} \pm \pi k, k \in I$

$x = \begin{cases} \pi/3 \\ \pi \end{cases} \pm \pi k, k \in I$

$\frac{\pi}{3} - \frac{3\pi}{3} = \frac{-2\pi}{3}$

$\pi/3 + \frac{3\pi}{3} = \frac{4\pi}{3} + \frac{3\pi}{3} = \frac{7\pi}{3}$

$\frac{7\pi}{3} + \frac{3\pi}{3} = \frac{10\pi}{3} + \frac{3\pi}{3} = \frac{13\pi}{3}$

$\pi - \pi = 0 - \pi = -\pi$

$\pi + \pi = 2\pi, 3\pi, 4\pi,$

list all answers in order →

$$X = \left\{ -\pi, -\frac{2\pi}{3}, 0, \frac{\pi}{3}, \pi, \frac{4\pi}{3}, 2\pi, \frac{7\pi}{3}, 3\pi, \frac{10\pi}{3}, 4\pi, \frac{13\pi}{3} \right\}$$

Zeros of Trig functions

A) 2 x-intercepts per period

$f(x) = 2\sin(3x) - 1$

$0 = 2\sin(3x) - 1$

$\frac{1}{2} = \sin(3x)$ → 2 x intercepts per period because there's 2 places where sin = 1/2 on the unit circle

$\left\{ \begin{matrix} \frac{\pi}{\quad} \\ \frac{\pi}{\quad} \end{matrix} \right. + \text{period}\,k, k \in \mathbb{Z}$

B) 1 x-intercept per period

$f(x) = \sin(3x) - 1$

$0 = \sin(3x) - 1$

$1 = \sin(3x)$ ⟶ only 1 x intercept per period because there's only 1 spot on unit circle where $\sin(x) = 1$

$\{\# \pm \text{period}\, k, k \in \mathbb{I}\}$

C) NO x-intercepts per period

$f(x) = \sin(3x) - 2$

$0 = \sin(3x) - 2$

$2 = \sin(3x)$

→ nowhere on unit circle does $\sin(x) = 2$ so there's no x intercepts for this graph.

HW: Worksheet additional trig equations