# Solving trig equations

Name: _____ Date: _____ Period: Key

**Section 5.1 objective 2: Solving Trig Equations Practice**

**Directions**: Solve for x algebraically, given the domain. Show all work.

1) $4\sin x + 2 = 0, \quad 0 \le x < 2\pi$

$\frac{4\sin x}{4} = \frac{-2}{4}$

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

$x = \frac{7\pi}{6} \quad x = \frac{11\pi}{6}$

2) $4\sec x + 8 = 0, \quad 0 \le x < 2\pi$

$\frac{4\sec x}{4} = \frac{-8}{4}$

$\sec x = -2$

$\cos x = -1/2$

$x = \frac{2\pi}{3} \quad x = \frac{4\pi}{3}$

3) $\cot x - \sqrt{3} = 0, \quad 0 \le x < 2\pi$

$\cot x = \sqrt{3} \quad \frac{1}{\tan} = \sqrt{3}$

$\tan = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

$\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{2} \cdot \frac{2}{\sqrt{3}} = \frac{1}{\sqrt{3}}$

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

$x = 7\pi/6$

4) $3\cot^2 x - 1 = 0, \quad 0 \le x < 2\pi$

$\frac{3\cot^2}{3} = \frac{1}{3}$

$\cot^2 = \frac{1}{3} \; ; \cot = \pm\frac{1}{\sqrt{3}}$

$\cot = \frac{\cos}{\sin}$

$x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{5\pi}{3}, \frac{4\pi}{3}$

5) $2\sin^2 x + 5\sin x = 3, \quad 0 \le x < 2\pi$

$2\sin^2 x + 5\sin x - 3 = 0$

let $\sin x = u$

$2u^2 + 5u - 3 = 0$

$(u - \frac{1}{2})(u + \frac{6}{3}) = 0$

$(2u - 1)(u + 3) = 0$

$2\sin x - 1 = 0$

$2\sin x = 1$

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

$x = \frac{\pi}{6} \quad x = 5\pi/6$

$\sin x + 3 = 0$

$\sin x = 3$

6) $2\tan^2 x - \tan x - 6 = 0, \quad 0 \le x < 2\pi$

$2u^2 - u - 6 = 0$

$3 \times -4 = -12, \; -1$

$(u + \frac{3}{2})(u - \frac{4}{2})$

$(2u + 3)(u - 2)$

$u = -\frac{3}{2} \quad u = 2$

$\tan x = -\frac{3}{2} \quad \tan x = 2$

$x = -0.98$ (Calc. $\tan^{-1}(-\frac{3}{2})$)

$x = 1.1$ (Calc. $\tan^{-1}(2)$)

7) $\sec x \sin x - 3\sin x = 0, \quad 0 \le x < 2\pi$

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

$\sin x = 0$

$x = 0, x = \pi$

$\sec x = 3$ (calc $\cos^{-1}(\frac{1}{3})$)

$\cos x = \frac{1}{3}$

$x = 1.23$

8) $\cos 3x = 0, \quad 0 \le x < 2\pi$

$\cos U = 0$

$U = \frac{\pi}{2}$

$3x = \pi/2$

$x = \pi/6$

$U = 3\pi/2$

$3x = 3\pi/2$

$x = \pi/2$

9) $\cos 2x = -\frac{1}{\sqrt{2}}, \quad 0 \le x < 2\pi$

a) if the domain is $0 \le x < 2\pi$

$\cos 2x = \frac{-1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$\cos 2x = \frac{\sqrt{2}}{2}$

$\cos u = -\frac{\sqrt{2}}{2}$

$2x = \frac{3\pi}{4} \quad 2x = \frac{5\pi}{4}$

$x = \frac{3\pi}{8} \quad x = \frac{5\pi}{8}$

b) if the domain is $-\pi \le x < \pi$

$2x = -\frac{5\pi}{4} \quad 2x = -\frac{3\pi}{4}$

$x = -\frac{5\pi}{8} \quad x = -\frac{3\pi}{8}$

10) $\cos^2 x - \cos x - 2 = 0$

a) if the domain is $-\pi \le x < \pi$

$u^2 - u - 2 = 0$

$-2 \times 1 = -2, \; -1$

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

$\cos x = 2$

$\cos x + 1 = 0$

$\cos x = -1$

$x = -\pi$

$\pi$ not included in $-\pi \le x < \pi$

b) if the domain is $-\frac{\pi}{2} < x < \frac{\pi}{2}$

No solution

$\cos x = -1$

There is no $\cos = -1$ in that interval