7.3 Solving Trig Equations

1. $x^2 - x^2 = x^2 - x^2$
2. $x(x-x) = (x+x)(x-x)$
3. $x\cancel{(x-x)} = (x+x)\cancel{(x-x)}$
4. $x = 2x$
5. $1x = 2x$
6. $1 = 2$

* Goal is to isolate the trig function in the equation...

Solve: $1 - 2\cos x = 0$ (x: angle)

$-1 \qquad -1$

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

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

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

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

$\frac{5\pi}{3} + 2\pi n$

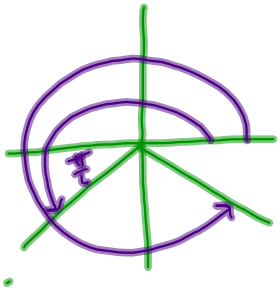
Solve: $\sin x + 1 = -\sin x$

$+\sin x \qquad +\sin x$

$2\sin x + 1 = 0$

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

$x = \sin^{-1}\left(-\frac{1}{2}\right)$



$$x = \frac{7\pi}{6} + 2\pi n$$

$$\frac{11\pi}{6} + 2\pi n$$

Solve: $\tan^2 x - 3 = 0$

$\tan^2 x = 3$

$\tan x = \pm\sqrt{3}$

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

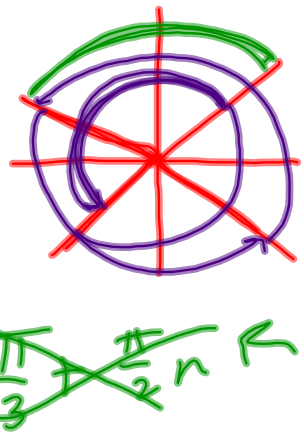
$\frac{2\pi}{3} + 2\pi n$

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

$\frac{5\pi}{3} + 2\pi n$

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

$\frac{2\pi}{3} + \pi n$

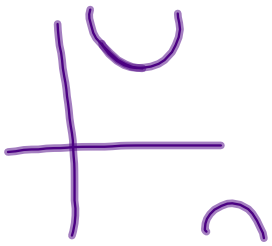


$\frac{\pi}{3} + \frac{\pi}{2} n$

$$\sec x \csc x = \csc x$$

$$\sec x \csc x - \csc x = 0$$

$$\csc x (\sec x - 1) = 0$$



$\csc x = 0$ $\quad$ $\sec x = 1$

$\varnothing$ $\quad$ $x = 2\pi n$

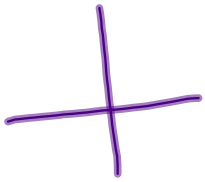
Solve the following on the interval $[0, 2\pi)$

$2\cos^2 x + \cos x - 1 = 0$

$(2\cos x - 1)(\cos x + 1) = 0$

$\cos x = \frac{1}{2}$ $\quad$ $\cos x = -1$

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



Solve the following on the interval $[0, 2\pi)$

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

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

$2-2\sin^2 x+3\sin x-3$

$-2\sin^2 x+3\sin x-1=0$

$2\sin^2 x-3\sin x+1=0$

$2x^2-3x+1$

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

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

$x=\frac{\pi}{6},\frac{5\pi}{6}$ $\quad$ $x=\frac{\pi}{2}$

Solve the following on the interval $[0, 2\pi)$

$$(\sec x + 1)^2 = (\tan x)^2$$

$\sec^2 x + 2\sec x + 1 = \sec^2 x - 1$

$\sec x = -1$

$x = \pi$

$\sec \pi + 1 \stackrel{?}{=} \tan \pi$

$0 = 0$ ✓

Find all solutions of:

$(\cos x + 1)^2 = (\sin x)^2$

$\cos^2 x + 2\cos x + 1 = 1 - \cos^2 x$

$2\cos^2 x + 2\cos x = 0$

$2\cos x(\cos x + 1)$

$\cos x = 0 \qquad \cos x = -1$

$x = \frac{\pi}{2} + 2\pi n \qquad x = \pi n$

$\frac{3\pi}{2}$ is extraneous!

$\cos\frac{3\pi}{2} + 1 = \sin\frac{3\pi}{2}$

$0 + 1 = -1$

$1 = -1$ NO!