# Solving Trig Equations

## FACTORING WITH PYTHAGOREAN SUBSTITUTIONS

## Solve over $[0, 2\pi)$.

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

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

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

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

$-1 \qquad\qquad -1$

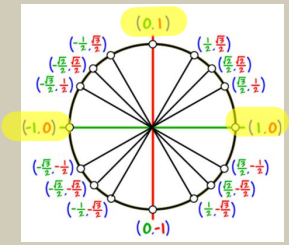
$-\sin^2 x + \sin x = 0$

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

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

$\sin x = 0 \qquad \sin x = 1$

$x = 0, \pi \qquad x = \frac{\pi}{2}$




$\left\{0, \frac{\pi}{2}, \pi\right\}$

## Solve over $[0, 2\pi)$.

- $\sin^2 x = \cos^2 x$

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

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

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

$+\cos^2 x \quad +\cos^2 x$

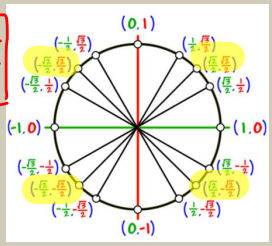
$1 = 2\cos^2 x$

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

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

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

$x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$




## Solve over $[0, 2\pi)$.

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

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

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

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

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

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

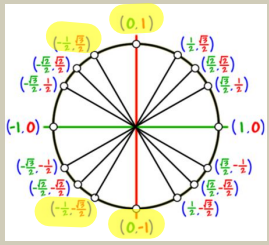
$2\cos^2 x + \cos x = 0$

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

$\cos x = 0 \qquad 2\cos x + 1 = 0$

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

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



# Solve over $[0, 2\pi)$.

- $\csc^2 x = 2\cot x$

$\cot^2 x + 1 = 2\cot x$

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

$(\cot x - 1)(\cot x - 1) = 0$

$\cot x - 1 = 0$

$\cot x = 1$

$\tan x = 1$

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

$\cot^2 x + 1 = \csc^2 x$

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

$(x-1)(x-1)$