Solving Trigonometric Equations

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

single answer in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ (restricted domain of sine)

$\pi/6$

$-\frac{7\pi}{6} \equiv \frac{5\pi}{6}$ $\quad \pi/6 \equiv -\frac{11\pi}{6} \equiv \frac{13\pi}{6}$

infinitely many x's all coterminal w/ $\pi/6$ or $5\pi/6$

$x = \pi/6 + 2\pi k$

$x = 5\pi/6 + 2\pi k$, $k \in \mathbb{Z}$

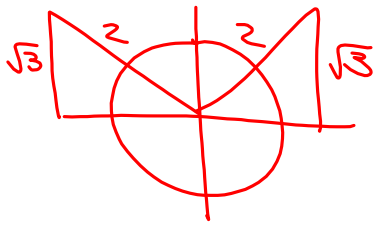
is an element of the set of integers (± whole #s)

Solve for $x \in [0, 2\pi)$.

2. $2\sin x = \sqrt{3}$

$\sin x = \frac{\sqrt{3}}{2}$

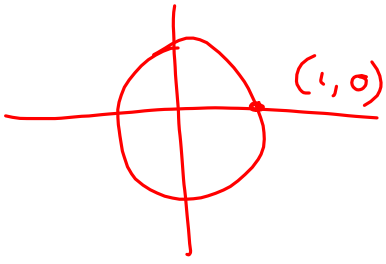
$x = \frac{\pi}{3}, \frac{2\pi}{3}$



4. $\cos x - 1 = 0$

$\cos x = 1$

$x = 0$



6. $2 \sin x \cos x = \sqrt{3} \sin x$

$\sin x$ $\sin x$

$2\cos x = \sqrt{3}$

$\cos x = \sqrt{3}/2$

$x^2 = x$

$x = 1$

$x^2 = x$

$x = 1$

$x^2 - x = 0$

$x(x-1) = 0$

$x = 0, \; x-1 = 0$

$x = 0, \; x = 1$

Algebra Review

$(x-2)(x-3)(x-4) = 0$

$\Rightarrow x-2=0$ or $x-3=0$ or $x-4=0$

$\Rightarrow x=2$ or $x=3$ or $x=4$

The **Zero Product Property** states:

If $AB = 0$, then $A = 0$ or $B = 0$.

$x^2 = 9$

$x = \pm\sqrt{9} = \pm 3$

$\sqrt{4} = 2$

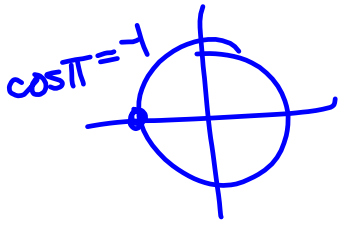
The **Square Root Theorem** states:

If $[f(x)]^2 = c$, then $f(x) = \pm\sqrt{c}$

$e^{\pi i} + 1 = 0$

Euler's equation

$e^{\pi i} = -1$



6. $2 \sin x \cos x = \sqrt{3} \sin x$

Solve for $x \in [0, 2\pi)$

$2\sin x \cos x - \sqrt{3}\sin x = 0$

$\sin x (2\cos x - \sqrt{3}) = 0$

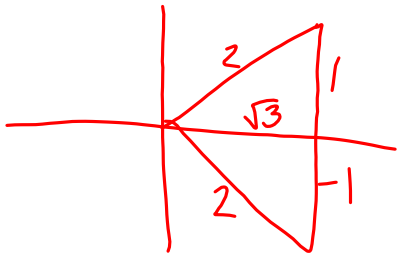
$\sin x = 0$ or $2\cos x - \sqrt{3} = 0$

$x = 0, \pi$

$2\cos x = \sqrt{3}$

$\cos x = \sqrt{3}/2$

$x = \pi/6, 11\pi/6$



6.6 Solving Trigonometric Equations

Solve for all values of x in the interval [0, 2pi)

8. $\cos^2 x - 1 = 0$

factor

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

$\cos x - 1 = 0, \cos x + 1 = 0$

$\cos x = \pm 1$

① pyth. id

$-\sin^2 x = 0$

$\sin^2 x = 0$

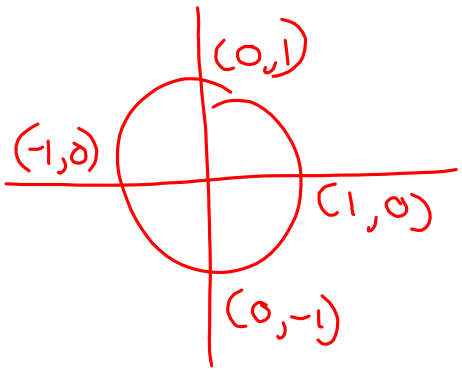
$\sin x = 0$

+1 & $\sqrt{}$

$\cos^2 x = 1$

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

$\cos x = \pm 1$



$x = 0, \pi$