5-3-2 Solving Trig Functions

Very similar to an equation for x

Now - solve for the trig function, then solve for x.

Ex 1: Isolate trig Function

Solve $2\tan x - \sqrt{3} = \tan x$ for all x

$\tan x = \sqrt{3}$ $\quad p = \pi$

$[0, \pi)$ $\quad x = \frac{\pi}{3}$

$(-\infty, \infty)$, $x = \frac{\pi}{3} + \pi n$

add pn

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

$x = \sqrt{3}$

Ex 2: Taking a Square Root

Solve: $4\sin^2 x + 1 = 4$ for all x.

$\sin^2 x = \frac{3}{4}$

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

when you take a Sq. Rt., include the $\pm$

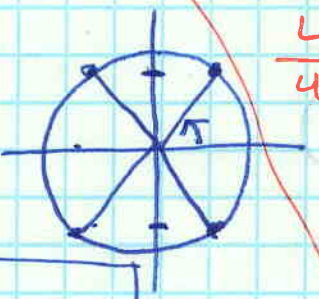
$x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

on $[0, 2\pi)$

$p = 2\pi$

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

$\frac{4\pi}{3} + 2\pi n, \frac{5\pi}{3} + 2\pi n$



$4x^2 + 1 = 4$

$-1 \quad -1$

$\frac{4x^2}{4} = \frac{3}{4}$

$x^2 = \frac{3}{4}$

$x = \pm\sqrt{\frac{3}{4}}$

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

Ex3: Factoring / Zero Product Property

Solve: $\cos x \sin x = 3\cos x$ on $[0, 2\pi)$

$\cos x \sin x - 3\cos x = 0$

DO NOT CANCEL OUT TRIG FUNCTIONS!

Factor $\cos x$: $\cos x(\sin x - 3) = 0$

Z.P.P.: $\cos x = 0$ $\quad$ $\sin x = 3$

$x = \frac{\pi}{2}, \frac{3\pi}{2}$ $\quad$ no solution

If $\cos x$ was cancelled, then these solutions would be missed.

Solve: $\cos^4 x + \cos^2 x - 2 = 0$ on $[0, 2\pi)$

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

$u^4 + u^2 - 2 = 0$

$u^2 + u - 2 = 0$

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

$x^4 \to (x^2)^2$

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

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

sqrt: $\cos x = \pm\sqrt{-2}$ $\quad$ $\cos x = \pm\sqrt{1} = \pm 1$

no sol. $\quad$ $x = 0, \pi$

331: 3, 5, 8-10, 13-17