Solving Trig Equations

1. Get all trig terms by themselves on one side of the equation.
2. Solve for the trig term by factoring, taking square roots, etc.
3. Evaluate your answer using the unit circle.

Ex) Solve. ✓ a) $2\sin^2(x) - 1 = 0$

$2\sin^2 x = 1$

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

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

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

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

✓ b) $\cos^2(x) + 3\cos(x) + 2 = 0$

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

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

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

no solutions $\qquad x = \pi$

✓ c) $2\cos(x) + \sqrt{2} = 0$

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

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

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

Verifying Trig Identities

Use reciprocal, quotient, and Pythagorean identities to manipulate one side of the equation to look like the other side.

Ex) Verify.

✓ a) $\csc^2(x)\sec^2(x) = \csc^2(x) + \sec^2(x)$

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

$= \frac{\cos^2 x + \sin^2 x}{\sin^2 x \cos^2 x}$

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

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

$= \csc^2 x \sec^2 x$

✓ b) $\frac{1}{1-\cos(x)} + \frac{1}{1+\cos(x)} = 2\csc^2(x)$

$\frac{1+\cos x + 1-\cos x}{(1-\cos x)(1+\cos x)}$

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

$= \frac{2}{\sin^2 x} = 2 \cdot \frac{1}{\sin^2 x} = 2\csc^2 x$