

SOLVING QUADRATIC TRIGONOMETRIC EQUATIONS

In the previous lesson, the trigonometric equations that we solved were all *linear*. In this lesson, however, we will consider some nonlinear trigonometric equations, giving special attention to *quadratic trigonometric equations*.

When learning to solve trigonometric equations, it is often helpful to consider analogous equations that do not involve trigonometric expressions. Check out the following examples:

Trigonometric Equation	Similar to...
$\sin^2 x = \frac{1}{2}$	$x^2 = \frac{1}{2}$
$\tan^2 x - \tan x = 0$	$x^2 - x = 0$
$\cos^2 x + 3\cos x + 2 = 0$	$x^2 + 3x + 2 = 0$
$3\sin^2 x - \sin x - 2 = 0$	$3x^2 - x - 2 = 0$
$\sin x + 2\sin x \cos x = 0$	$x + 2xy = 0$
$\cot x \cos x = \cot x$	$xy = x$
$\cos x \sin x = 0$	$xy = 0$
$\tan \theta \cos^2 \theta = \tan \theta$	$xy^2 = x$

Solve each of the above trigonometric equations on a separate page. Use degree measure with $0^\circ \leq x \leq 360^\circ$ for the first four equations and use radian measure with $0 \leq x \leq 2\pi$ for the final four equations. It may be helpful to use the non-trigonometric equations as a guide!

Sometimes it is necessary to use a trigonometric identity to help solve an equation...

Example

Solve the following equations (using degree measure) for $0^\circ \leq x \leq 360^\circ$.

a) $-10\cos^2 x - 3\sin x + 9 = 0$

b) $\sec^2 x + 5\tan x = -2$