4.10.2 Solving Quadratic Trigonometric Equations
(Solutions)

In the following 4 examples, you will deal with 4 different methods to deal with quadratic trigonometric equations.

Method 1: Common Factor

Solve for θ, $0 \le \theta \le 2\pi$

$\tan\theta\cos^2\theta = \tan\theta$

$\tan\theta\cos^2\theta - \tan\theta = 0$

$\tan\theta(\cos^2\theta - 1) = 0$

$\tan\theta = 0$ or $\cos^2\theta - 1 = 0$

$\theta = 0, \pi, 2\pi$

$\cos^2\theta = 1$ sqrt

$\cos\theta = \pm 1$

$\cos\theta = 1$, $\cos\theta = -1$

$\theta = 0, 2\pi$ $\theta = \pi$

$\theta = 0, \pi, 2\pi$

Method 2: Trinomial Factor

Solve for x, $0 \le x \le 2\pi$

$3\sin^2 x - \sin x - 2 = 0$

Let $q = \sin x$

$3q^2 - q - 2 = 0$

$(3q-3)(3q+2) = 0$

3

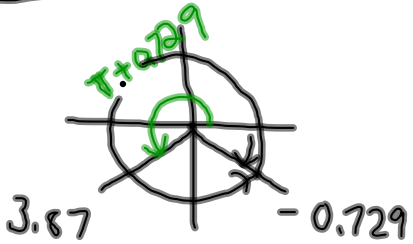
$(q-1)(3q+2) = 0$

Solve for q

$q = 1, -\frac{2}{3}$

So $\sin x = 1$ or $\sin x = -\frac{2}{3}$

$x = \frac{\pi}{2}$ $x = 3.87, 5.55$



$+ 2\pi$

$= 5.55$

Method 3: Identities and Factoring

Solve for x, $0 \le x \le 2\pi$

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

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

$-10(1-\sin^2 x) - 3\sin x + 9 = 0$

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

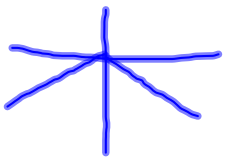
$10\sin^2 x - 3\sin x - 1 = 0$

$(5\sin x + 1)(2\sin x - 1) = 0$

Solve for $\sin x$

$\sin x = -\frac{1}{5}$ $\sin x = \frac{1}{2}$

$x = 3.34, 6.08$ $x = \frac{\pi}{6}, \frac{5\pi}{6}$



Method 4: Identities and Quadratic Formula

Solve for x, $0 \le x \le 2\pi$

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

$1 + \tan^2 x + 5\tan x = 2$

- Move all to LS
- Let $q = \tan x$
- Use Quad Form. to Solve for q.
- Then put $\tan x$ back and find angles

$x = 2.5327, 5.6743, 1.7992, 4.9408$

Identity for $\sec^2 x =$

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

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

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

$= 1 + \tan^2 x$