

Section 8.5
Solving Trig Equations

Example 1

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

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

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

for $0 \leq x \leq 360^\circ$

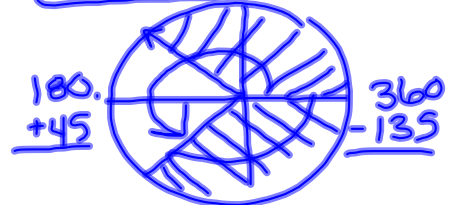
$$x = \cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$$

$$x = 45^\circ, 315^\circ$$



$$x = \cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$$

$$x = 135^\circ, 225^\circ$$



Example 2

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

for $0 \leq x \leq 360^\circ$

$$x^2 + 3x + 2 = 0$$

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

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

$$\frac{\sin x + 1 = 0}{-1 \quad -1}$$

$$\sin x = -1$$

$$x = 270^\circ$$

$$\frac{\sin x + 2 = 0}{-2 \quad -2}$$

$$\sin x = -2$$

$$\emptyset$$

Example 3

$$\cos x \cdot \tan x = 3\cos x$$

for $0 \leq x \leq 2\pi$

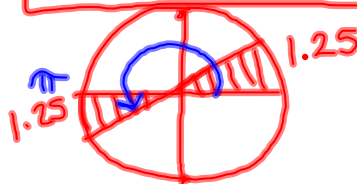
$$\cancel{\cos x} \cdot \frac{\sin x}{\cancel{\cos x}} = 3\cos x$$

$$\frac{\sin x}{\cos x} = \frac{3\cancel{\cos x}}{\cancel{\cos x}}$$

$$\tan x = 3$$

$$x = \tan^{-1}(3)$$

$$x = 1.25, 4.39$$



*check answers if solving eq. with tan or cot because they can be undefined

$$\pi + 1.25 = 4.39$$

Example 4

$$2\cos x = \sin x$$

for $0 \leq x \leq 360^\circ$

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

$$2 = \tan x$$

$$x = \tan^{-1}(2)$$

$$x = 63.43^\circ$$

$$180 + 63.43 = 243.43^\circ$$



Example 5

$$2\sin x - \csc x = 1 \quad \text{for } 0 \leq x \leq 360^\circ$$

$$\sin \left(2\sin x - \frac{1}{\sin x} \right) = (1) \sin$$

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

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

$$2x^2 - x - 1 = 0$$

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

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

$$2\sin x + 1 = 0$$

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

$$x = \sin^{-1}(-\frac{1}{2}) = -30^\circ$$



$$\sin x - 1 = 0$$

$$\sin x = 1$$

$$x = 90^\circ$$



Example 6

$$2\cot^2 x + 3\csc x = 1 \quad \text{for } 0 \leq x \leq 2\pi$$

$$2(\csc^2 x - 1) + 3\csc x = 1$$

$$2\csc^2 x - 2 + 3\csc x = 1$$

$$2\underline{\csc^2 x} + 3\underline{\csc x} - 3 = 0$$

$$2x^2 + 3x - 3 = 0$$

$$a = 2$$

$$b = 3$$

$$c = -3$$

$$\frac{-3 \pm \sqrt{9 - 4(2)(-3)}}{2(2)}$$

$$= \frac{-3 \pm \sqrt{33}}{4}$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = .686 \rightarrow x = -2.186$$

$$\csc x = .686 \quad \csc x = -2.186$$

$$\sin x = \frac{1}{.686}$$

$$\sin x = \frac{1}{-2.186}$$

$$\sin x = 1.46$$

$$x = \sin^{-1}\left(\frac{1}{-2.186}\right)$$

\emptyset

$$x = -.475$$

* sin x cannot be greater than 1



$$2\pi - .475$$

$$= 5.81$$

$$\pi + .475 = 3.62$$