

Section 8.5: Solving Trigonometric Equations

Essential Question:

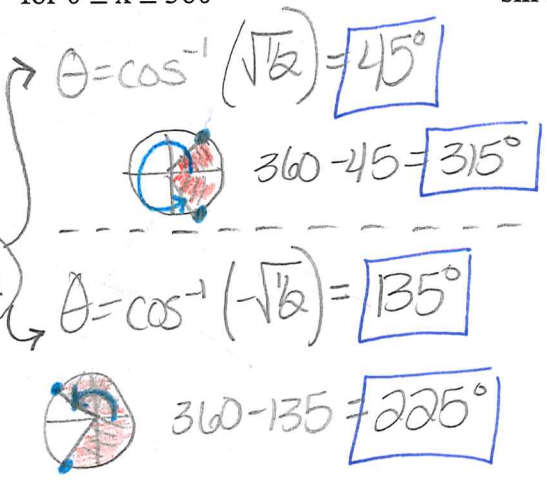
How do you solve trig functions?

Solve the following problems.

Example 1

$2\cos^2x - 1 = 0$ for $0 \leq x \leq 360^\circ$

$2\cos^2 = 1$
 $\cos^2 = 1/2$
 $\cos\theta = \pm\sqrt{1/2}$



$\theta = \cos^{-1}(\pm\sqrt{1/2})$

$\theta = \cos^{-1}(\sqrt{1/2}) = 45^\circ$
 $\theta = \cos^{-1}(-\sqrt{1/2}) = 135^\circ$

Example 3

$\cos x \cdot \tan x = 3\cos x$ for $0 \leq x \leq 2\pi$

$\cos \cdot \tan - 3\cos = 0$

$\cos(\tan - 3) = 0$

$\cos\theta = 0$ $\tan\theta - 3 = 0$

$\tan\theta = 3$

$\theta = 90^\circ$
 $\theta = 270^\circ$

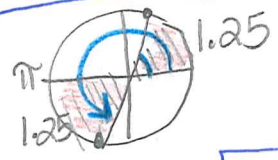
$\theta = \tan^{-1}(3)$

$\theta = 1.25$

OR

$\theta = \pi/2$

$\theta = 3\pi/2$



$\pi + 1.25 = 4.39$

Be careful
 \tan @ $\pi/2$ & $3\pi/2$
 $= \frac{y}{x} = \frac{\#}{0}$ undefined

Example 2

$\sin^2x + 3\sin x + 2 = 0$ for $0 \leq x \leq 360^\circ$

Look @ this as...

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

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

$x = -2$ $x = -1$

$\sin\theta = -2$ $\sin\theta = -1$

NO SOL.

$(-1 \leq \sin \leq 1)$

$\theta = 270^\circ$

from unit circle

Example 4

$2\cos x = \sin x$ for $0 \leq x \leq 360^\circ$

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

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

$2 = \tan\theta$

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

$\theta = 63.43^\circ$



$180 + 63.43$

$\theta = 243.43^\circ$

Example 5

$2\sin x - \csc x = 1$

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

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

$2\sin x - \frac{1}{\sin x} - 1 = 0$

$\sin (2\sin x - \frac{1}{\sin x} - 1) = 0$

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

think as \rightarrow

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

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

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

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

$\sin \theta = 1 \rightarrow \theta = 90^\circ$

$\theta = \sin^{-1}(-\frac{1}{2})$

$\theta = -30^\circ$



180 +30 = 210
360 -30 = 330

$210^\circ \& 330^\circ$

Section 8.5 Summary:

If a single trig exists, isolate and take the inverse. If more than 1 trig, change in terms of 1 trig. Try setting equation = 0 in order to factor and set each factor = 0.

Example 6

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

Note: $\cot^2 = \csc^2 - 1$

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

*change into terms of 1 trig exp.

$2(\csc^2 - 1) + 3\csc - 1 = 0$

$2\csc^2 - 2 + 3\csc - 1 = 0$

$2\csc^2 + 3\csc - 3 = 0$

$2x^2 + 3x - 3 = 0$
a b c

*Not factorable

$x = \frac{-3 \pm \sqrt{(3)^2 - 4(2)(-3)}}{2(2)}$

get 2 decimals \rightarrow

$x = \frac{-3 \pm \sqrt{9+24}}{4} = \frac{-3 \pm \sqrt{33}}{4}$

$\csc \theta = .686$

$\csc \theta = -2.186$

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

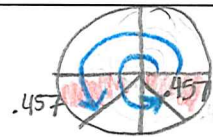
$\sin \theta = \frac{1}{-2.186}$

$\theta = \sin^{-1}(1.46)$

$\theta = \sin^{-1}(-.457)$

NO SOLUTION

$\theta = -.475$ sliced pie



$2\pi - .475$

$= 5.81$

$\pi + .475$

$= 3.62$

Answer must be positive