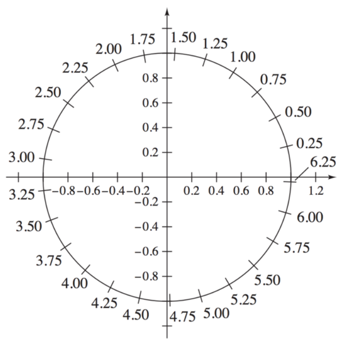
Solving Trigonometric Equation Review

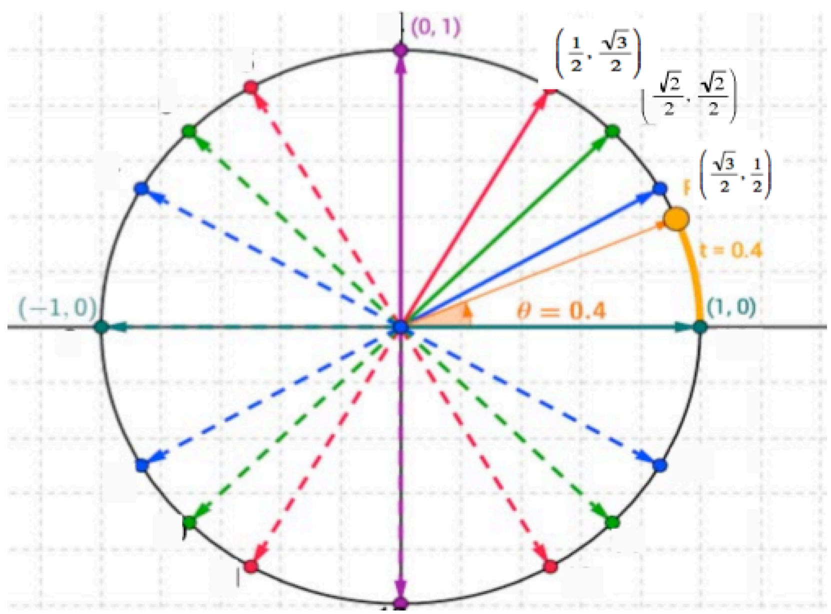
Introduction to Solving Basic Trigonometric Equations

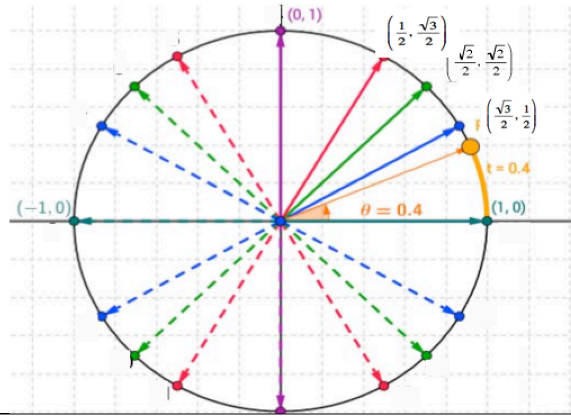
(You may need to review the unit circle and finding trig values first, since this is similar to finding trig values, but backwards)

<u>Using "Unit Circle Wrap" idea;</u>



<u>Special Number Inputs</u>





Solve: $\sin(t) = \frac{\sqrt{2}}{2}$

This is saying, find the real number (arc length or corresponding angle, in radians) whose corresponding point on the unit circle has Y value of $\frac{\sqrt{2}}{2}$

Why Y value? ____________________________

How many terminal sides are there corresponding to this________________________

How many values of t? (or think in angles) ____________________________

How do we express infinitely many answers?____________________________

Sometimes we are asked to solve for t on a restricted domain:

Solve: $\sin(t) = \frac{\sqrt{2}}{2}$ for $0 < t < \frac{\pi}{2}$ __________________________

Solve: $\sin(t) = \frac{\sqrt{2}}{2}$ for $0 < t < 2\pi$ __________________________

Solve: $\sin(t) = \frac{\sqrt{2}}{2}$ for $-2\pi < t < 0$ __________________________

Solve: $\sin(t) = \frac{\sqrt{2}}{2}$ for $0 < t < 4\pi$ __________________________

Examples: While you are learning the process, I highly encourage you to draw the unit circle and find the location of the terminal sides corresponding to the solution.

Solve: $\cos t = -\frac{1}{2}$

This is asking us to find the real number (arc length or corresponding angle, in radians) whose corresponding point on the unit circle has_____________value of $\frac{-1}{2}$

Solutions: ________________________

Solve: $\cos t = -\frac{1}{2}$ for $0 < t < \pi$ ________________________

Solve: $\cos t = 1$

This is asking us to find the real number (arc length or corresponding angle, in radians) whose corresponding point on the unit circle has_____________value of 1

Solutions: ________________________

Solve: $\cos t = 1$ $\cos(t) = 1$ for $0 \le t < 2\pi$ ________________________

Solve: $\sin(t) = 0$

This is asking us to find the real number (arc length or corresponding angle, in radians) whose corresponding point on the unit circle has_____________value of 0

Solutions: ________________________

Solve: $\sin(t) = 0$ for $0 < t < \pi$ ________________________

Solve: $\sin(t) = \frac{-\sqrt{3}}{2}$

This is asking us to find the real number (arc length or corresponding angle, in radians) whose corresponding point on the unit circle has_____________value of $\frac{-\sqrt{3}}{2}$

Solutions: ________________________

Solve: $\sin(t) = -\sqrt{3}/2$ for $-\frac{\pi}{2} < t < \frac{\pi}{2}$ ________________________

Using a graph to visualize solutions to a trig equation.

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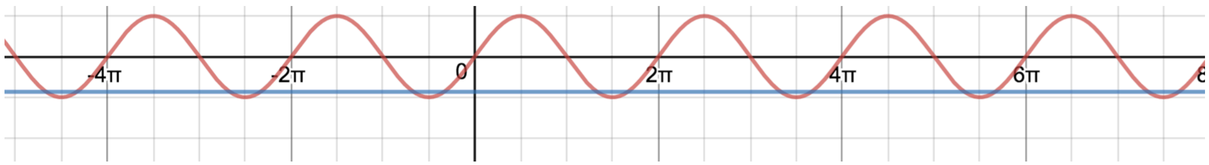
Solve: $\sin(t) = -\sqrt{3}/2$ ____________________

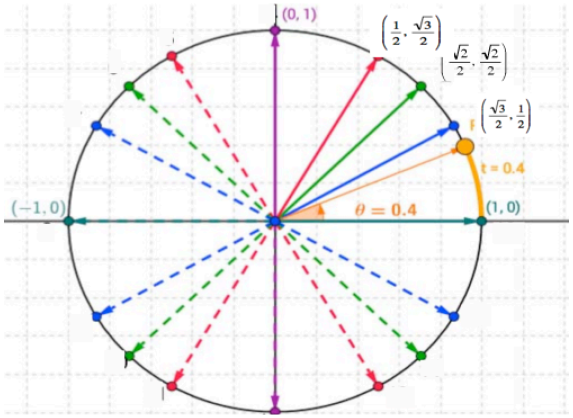
Solve: $\sin(t) = -\sqrt{3}/2$ for $0 < t < \pi$ ____________________

Solve: $\sin(t) = -\sqrt{3}/2$ for $0 < t < 2\pi$ ____________________

Solve: $\sin(t) = -\sqrt{3}/2$ for $-\frac{\pi}{2} \le t \le \frac{\pi}{2}$ ____________________



More Solving Basic Trigonometric Equations :



Solve: $\tan(t) = 1$

This is saying, find the real number (arc length or corresponding angle, in radians) whose corresponding point on the unit circle has y/x value of 1.
Note: Unless you know the tangent values of the key angles directly, this can be challenging.

How many terminal sides are there corresponding to this______________________

How many values of t? (or think in angles) __________________________

How do we express infinitely many answers?__________________________

Note: we can write this in a more compact way: _______________________

Sometimes we are asked to solve for t on a <u>restricted domain</u>:

Solve: $\tan(t) = 1$ for $0 < t < 2\pi$ ________________________

Solve: $\tan(t) = 1$ for $-\frac{\pi}{2} < t < \frac{\pi}{2}$ ________________________

Example: Find all solutions:

$\tan(t) = \sqrt{3}$ $\cot(t) = -\sqrt{3}$ $\sec(t) = -2$

Solving Trig equations requiring isolating the trig funtion

First isolate the trig function first, then solve for the argument

1) Solve: $2\cos(\theta) - 1 = 0; \quad 0 \le \theta < 2\pi$

2) Solve $\tan^2(t) - 1 = 0$

Solving Trig equations when there is an expression in the argument instead of just a variable.

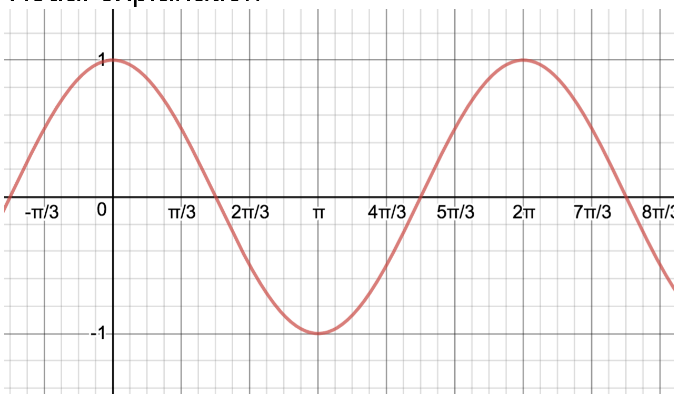
First solve for the argument as a whole, then the variable.

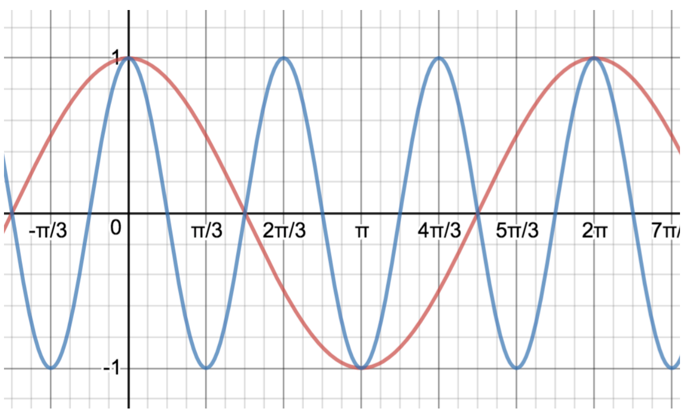
3) Solve: $\sin(x - 3) - 1 = 0$

4) Solve $\tan\left(\frac{x}{4}\right) = \frac{\sqrt{3}}{3}$

5) Solve $\cos(3\theta)+1=0; \quad 0 \le \theta < 2\pi$ *******

Visual explanation





Solving Trig equations using factoring and the zero product law.

(1) Solve: $2\cos^2(\theta)-\cos(\theta)-1=0$ can use substitution

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(2) Solve for $0 \le x < 2\pi;$ $\sqrt{3}\sin(x)\tan(x)=\sin(x)$ Note: ______________________

Solving Trig equations using identities

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

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(2) $\cos(2\theta) + 6\sin^2(\theta) = 4$

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(3) Solve for $0 \le x < 2\pi$; $\sin(x)\cos(x) = \frac{1}{4}$