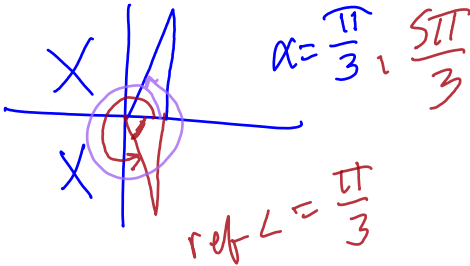


Date: 2/12/24

Section: 6.6

Objective: I can solve for all angles in a trig equation.

Example: Find all real numbers that satisfy the equation $\cos \alpha = \frac{1}{2}$ from $[0, 2\pi)$. This means find all the angles where the adjacent side is positive $\frac{1}{2}$ in the unit circle.



Basic steps for finding ALL solutions to $\cos x = a$:

1. to get $\cos \alpha$ by itself

*****One of these solutions will be $s = \cos^{-1} a$ and the other will be $2\pi - s = 2\pi - \cos^{-1} a$.

2. draw Δ , find angles, add $2\pi k$ or $360^\circ k$

Basic steps for finding ALL solutions to $\sin x = a$:

1. to get $\sin \alpha$ by itself

*****You can do this by looking at the unit circle (usually this is less confusing) or by working algebraically. If $s = \sin^{-1} a > 0$, one of these solutions will be $s = \sin^{-1} a$ and the other will be $\pi - s = \pi - \sin^{-1} a$. If $s = \sin^{-1} a < 0$, the two solutions are $2\pi + s = 2\pi + \sin^{-1} a$ and $\pi - s = \pi - \sin^{-1} a$.

2. draw Δ , find angles, add $2\pi k$ or $360^\circ k$

Don't let the algebra freak you out! All you are doing is finding all the angles on the unit circle that satisfy the equation and adding $2k\pi$ to each one to form your solution set.

Basic steps for finding ALL solutions to $\tan x = a$:

1. get $\tan x$ by itself

*****This will be either $s = \tan^{-1} a$ if this value is positive, or $s + \pi = \tan^{-1} a + \pi$ if $\tan^{-1} a$ is negative.

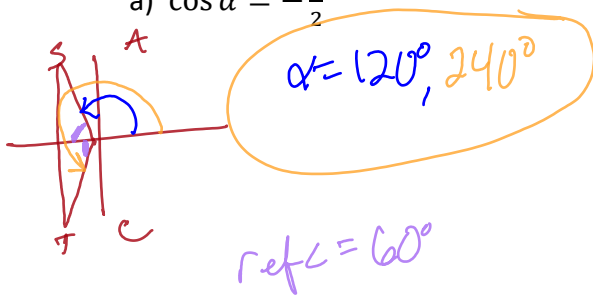
2. draw Δ , find angles, add πk or $180^\circ k$

(Remember that the tangent repeats every π instead of every 2π like sine and cosine.)

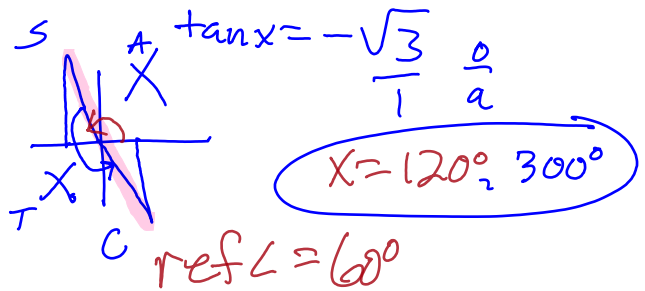
— means only \angle 's not $+2\pi k$

Examples: Find all angles in the interval $[0^\circ, 360^\circ]$ that satisfy each equation. Round approximations to the nearest tenth of a degree. Work is to draw triangles.

a) $\cos \alpha = -\frac{1}{2}$

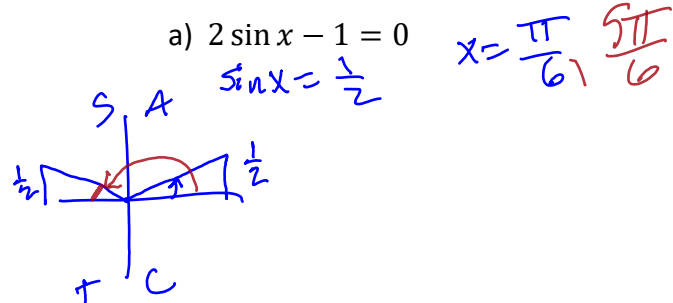


b) $\tan x + \sqrt{3} = 0$

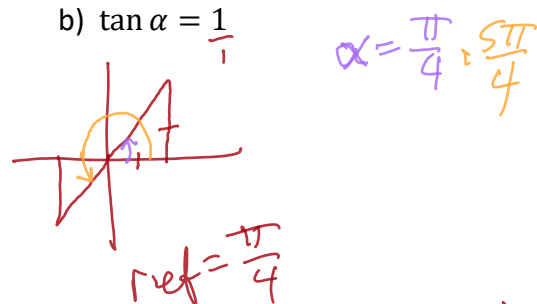


Examples: Find all angles in the interval $[0, 2\pi]$ that satisfy each equation. Round to the nearest hundredth. Draw triangles.

a) $2 \sin x - 1 = 0$



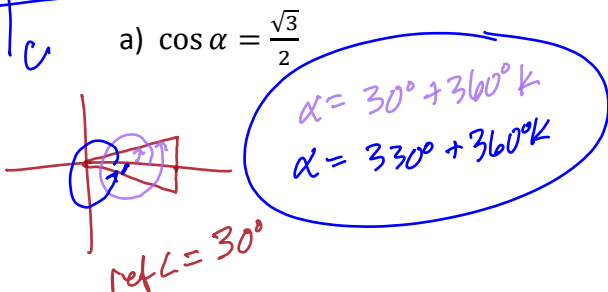
b) $\tan \alpha = \frac{1}{1}$



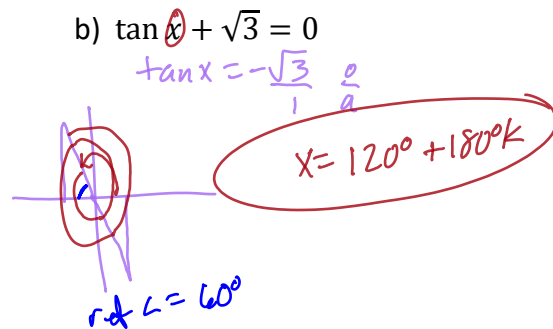
Examples: Find all angles in degrees that satisfy each equation. Draw triangles.

no interval write eqs

a) $\cos \alpha = \frac{\sqrt{3}}{2}$

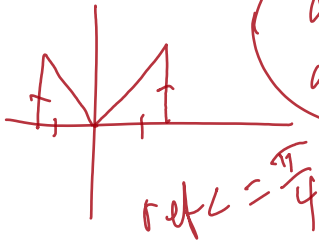


b) $\tan \theta + \sqrt{3} = 0$



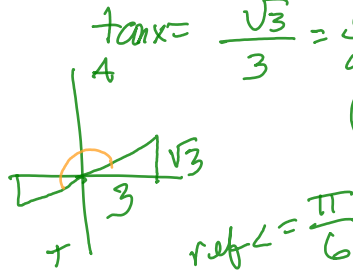
Examples: Find all real numbers in terms of π that satisfy each equation. Draw triangles.

a) $\sin \alpha = \frac{\sqrt{2}}{2}$



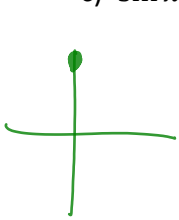
$\alpha = \frac{\pi}{4} + 2\pi k$
 $\alpha = \frac{3\pi}{4} + 2\pi k$

b) $-3 \tan x + \sqrt{3} = 0$



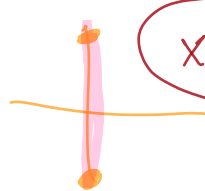
$x = \frac{\pi}{6} + \pi k$

c) $\sin x = 1$



$x = \frac{\pi}{2} + 2\pi k$

d) $\cos x = 0$

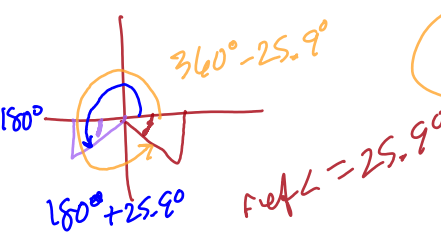


$x = \frac{\pi}{2} + \pi k$

Examples: Find all angles in the interval $[0^\circ, 360^\circ)$ that satisfy each equation. Round approximations to the nearest tenth of a degree. Draw triangles because your calculator will only give you one of the answers.

a) $\sin x = -0.4375$

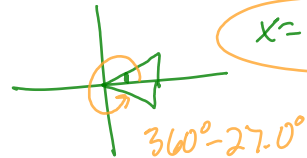
$\sin^{-1}(-0.4375) \approx -25.9^\circ$



$x \approx 205.9^\circ, 334.1^\circ$

b) $\cos x = 0.8913$

$\cos^{-1}(0.8913) = 27.0^\circ$

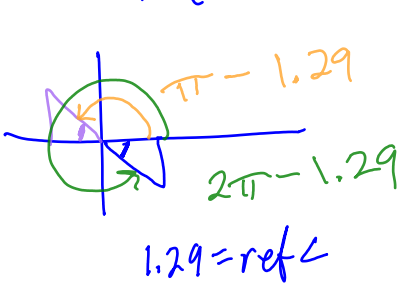


$x = 27.0^\circ, 333.0^\circ$

Examples: Find all angles in the interval $[0, 2\pi)$ that satisfy each equation. Round to the nearest hundredth. Draw triangles because your calculator will only give you one of the answers.

a) $\tan \alpha = -3.5$

$\tan^{-1}(-3.5) \approx -1.29$

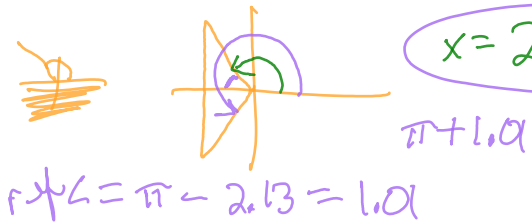


$\alpha \approx 1.85, 4.99$

b) $6 \cos x + \sqrt{10} = 0$

$\cos x = -\frac{\sqrt{10}}{6}$

$\cos^{-1}\left(-\frac{\sqrt{10}}{6}\right)$



$x = 2.13, 4.15$