Warm-up!

Let θ be an angle graphed in standard form. If the terminal ray of θ passes through the point $(-2,5)$, find...

$\sin\theta$

$\cos\theta$

$\tan\theta$

Trig Functions, Day 4

- Speed Quiz: Q1+Quadrantals
- (3.5) Even/Odd Properties
- (3.10) Solving Basic Trig Equations

Homework: Solving Basic Trig Equations + More Evaluating

Quiz Next Class

- Vocab: Reference Angle, Coterminal Angle, Standard Form, Terminal Ray
- Points on Circles in Planes
- Evaluating Trig Functions of Obtuse and Negative Angles

Even-Odd Identities:

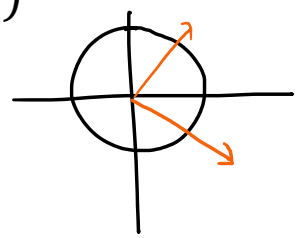
$\cos(-\theta) = \cos\theta$
$\sec(-\theta) = \sec\theta$
} Even Functions

$\sin\left(-\frac{\pi}{6}\right) = -\sin\frac{\pi}{6}$

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

$\sin(-\theta) = -\sin\theta$
$\csc(-\theta) = -\csc\theta$
$\tan(-\theta) = -\tan\theta$
$\cot(-\theta) = -\cot\theta$
} Odd Functions

$\cos\theta = x$



$\cos\left(-\frac{2\pi}{3}\right) = \cos\left(\frac{2\pi}{3}\right)$

You don't need to do these on your own. Let's just do them together, writing a ton of equivalent expressions. Your job is to make sure you understand how each step is done/why things are equal.

$$\sin\left(-\frac{7\pi}{6}\right) =$$

$$-\sin\left(\frac{7\pi}{6}\right) = -\sin\left(-\frac{5\pi}{6}\right)$$

$$\sin\left(\frac{-7\pi}{6}\right) = +\sin\left(\frac{\pi}{6}\right) = \frac{1}{2}$$

$$= -\left(-\sin\left(\frac{5\pi}{6}\right)\right) = \sin\left(\frac{5\pi}{6}\right)$$

$$\cos\left(-\frac{5\pi}{2}\right) =$$

$$\csc\left(\frac{23\pi}{6}\right) =$$

$$\csc\left(\frac{11\pi}{6}\right) = \csc\left(-\frac{\pi}{6}\right) = -\csc\left(\frac{\pi}{6}\right) = -2$$

$$\frac{23\pi}{6} - \frac{12\pi}{6} = \frac{11\pi}{6}$$

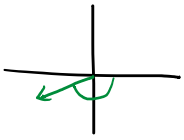
If $\sin(-t) = \frac{3}{8}$, find...

$\sin(t) =$ $-\frac{3}{8}$

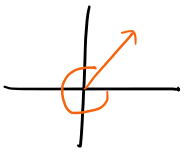
$\csc(t) =$ $-\frac{8}{3}$

Evaluate

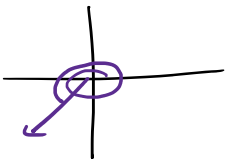
$\sin\left(-\frac{5\pi}{6}\right) = -\sin\left(\frac{\pi}{6}\right) = -\frac{1}{2}$



$\tan\left(-\frac{5\pi}{3}\right) = \tan\left(\frac{\pi}{3}\right) = \sqrt{3}$



$\sec\left(\frac{13\pi}{4}\right) = -\sec\left(\frac{\pi}{4}\right) = -\sqrt{2}$



$\cos\left(\frac{16\pi}{3}\right) = -\cos\left(\frac{\pi}{3}\right) = -\frac{1}{2}$

S A T C

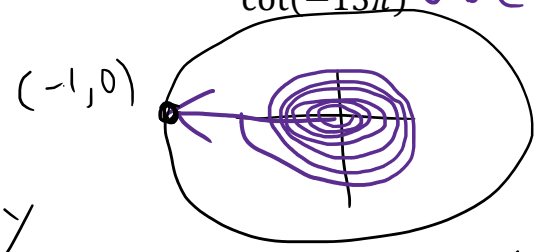
$\frac{16\pi}{3} - \frac{6\pi}{3} - \frac{6\pi}{3} = \frac{4\pi}{3}$

$\csc\left(-\frac{3\pi}{2}\right) = 1$

$\sin\theta = y$

$\csc\theta = \frac{1}{y}$

$\cot(-13\pi)$ undefined



$\tan\theta = \frac{y}{x}$

$\cot\theta = \frac{x}{y}$ $\frac{-1}{0}$

Which is not equivalent to the others

$\sin\left(\frac{7\pi}{6}\right)$

$\tan\left(-\frac{4\pi}{3}\right)$

$\cos\left(\frac{2\pi}{3}\right)$

$\cot\left(\frac{11\pi}{6}\right)$

$\sin\left(-\frac{11\pi}{6}\right)$

$\tan\left(-\frac{\pi}{3}\right)$

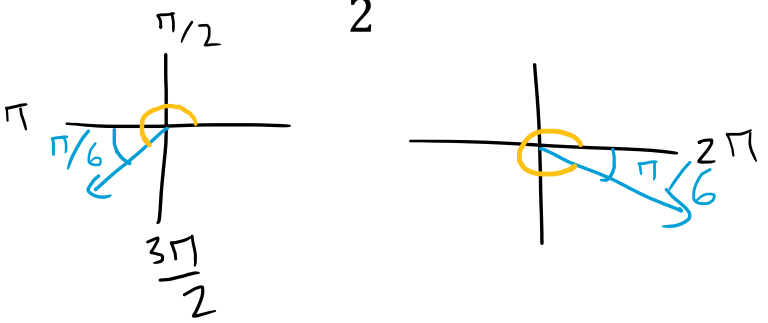
$\cos\left(-\frac{2\pi}{3}\right)$

$\cot\left(-\frac{5\pi}{6}\right)$

1) Isolate the trigonometric expression
2) Figure out the possible quadrants based on the sign of the number (i.e. only pay attention to positive vs negative)
3) Figure out the reference angle based on the magnitude of the number (i.e. ignore negative)
4) Combine info to determine θ

Example: Find the two values of θ in the interval $0 \leq \theta < 2\pi$ that solve the equation.

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



$\pi + \frac{\pi}{6}$

$\frac{7\pi}{6}$

$2\pi - \frac{\pi}{6}$

$\frac{12\pi}{6} - \frac{\pi}{6}$

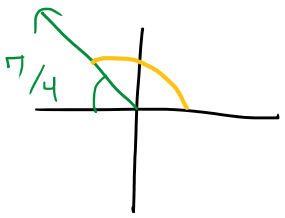
$\frac{11\pi}{6}$

Find the two values of θ in the interval $\square$ that solve the equation.

$\sqrt{2}$

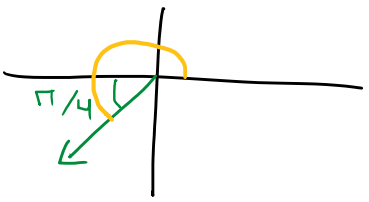
$\cos\theta = -\frac{1}{\sqrt{2}}$

$\cos\theta = -\frac{\sqrt{2}}{2}$



$\pi - \frac{\pi}{4}$

$\theta = \frac{3\pi}{4}$

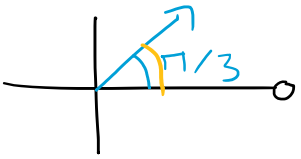


$\pi + \frac{\pi}{4}$

$\theta = \frac{5\pi}{4}$

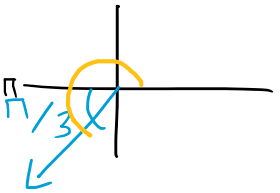
$\cot(\theta) = \frac{\sqrt{3}}{3} = \frac{1}{\sqrt{3}}$

$\tan(\theta) = \sqrt{3}$



$\pi/3$

$\theta = \frac{\pi}{3}$



$\pi + \frac{\pi}{3}$

$\theta = \frac{4\pi}{3}$

Find all values of θ in the interval $0 \leq \theta < 2\pi$ that solve the equation.

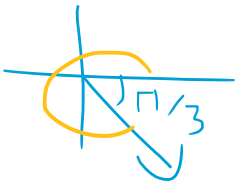
$$4(\cos\theta)^2 = 1$$

$\sqrt{(\cos\theta)^2} = \sqrt{\frac{1}{4}}$

$\cos\theta = \frac{1}{2}$

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

$\pi/3$



$2\pi - \frac{\pi}{3}$

$\frac{5\pi}{3}$

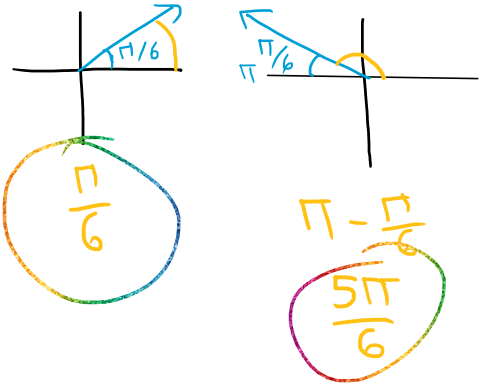
Find all solutions in the interval $0 \leq \theta < 2\pi$

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

$2\sin\theta - 1 = 0$

$2\sin\theta = 1$

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



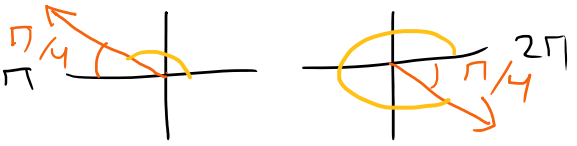
$\frac{\pi}{6}$

$\pi - \frac{\pi}{6}$

$\frac{5\pi}{6}$

$\tan\theta + 1 = 0$

$\tan\theta = -1$



$\pi - \frac{\pi}{4}$

$\frac{3\pi}{4}$

$2\pi - \frac{\pi}{4}$

$\frac{7\pi}{4}$

Solve over $[0,2\pi)$

What makes this question different?

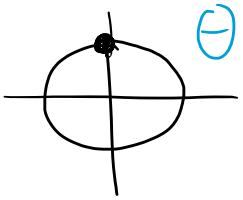
$$\sin(\theta) = -1$$

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

$\sin\theta - 1 = 0$

$\sin\theta = 1$

$\theta = \frac{\pi}{2}$



$\sin\theta + 2 = 0$

$\sin\theta = -2$

impossible