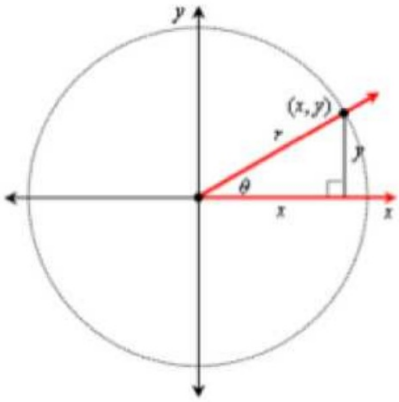
9.3 Evaluating Trigonometric Expressions

*See printout.

General Definition of the Trigonometric Functions



1. $\sin\theta =$ y/r

2. $\cos\theta =$ x/r

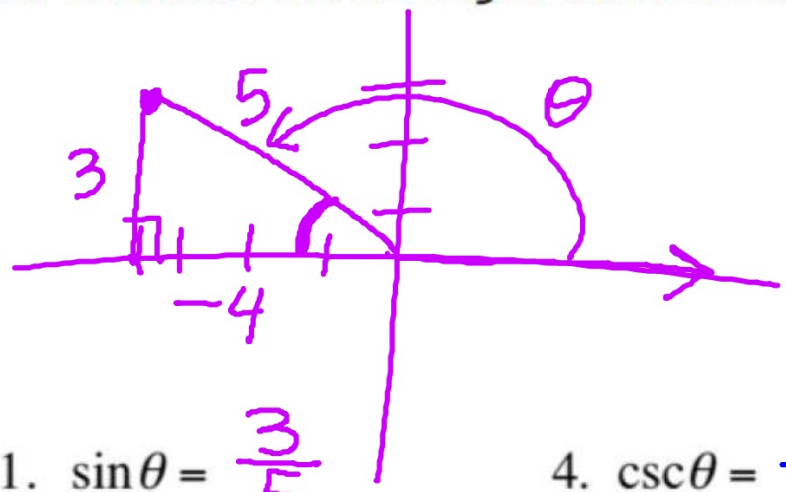
3. $\tan\theta =$ y/x

4. $\csc\theta =$ r/y

5. $\sec\theta =$ r/x

6. $\cot\theta =$ x/y

ex: Let (-4, 3) be a point on the terminal side of an angle, theta. Evaluate the six trigonometric functions of theta.



1. $\sin\theta = \frac{3}{5}$

2. $\cos\theta = \frac{-4}{5}$

3. $\tan\theta = -\frac{3}{4}$

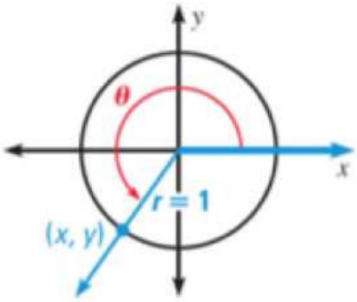
4. $\csc\theta = \frac{5}{3}$

5. $\sec\theta = \frac{5}{-4}$

6. $\cot\theta = \frac{-4}{3}$

The Unit Circle

The unit circle is a circle centered at the origin with a radius of one unit.



1. $\sin\theta = y$
2. $\cos\theta = x$
3. $\tan\theta = \frac{y}{x}$
4. $\csc\theta = \frac{1}{y}$
5. $\sec\theta = \frac{1}{x}$
6. $\cot\theta = \frac{x}{y}$

Positive Trigonometric Functions

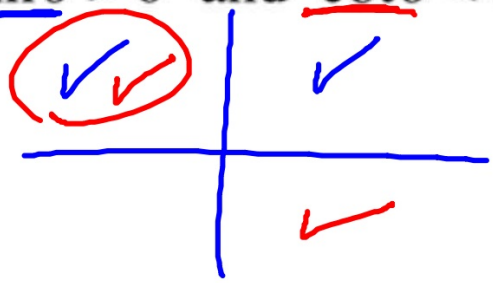
Students *sine* cosecant	**A**ll *all*
Take *tangent* cotangent	**C**alculus *cosine* secant

y-coord (+)

Use the acronym: ASTC

ex: In what quadrant is...

a) $\sin\theta > 0$ and $\cot\theta < 0$?



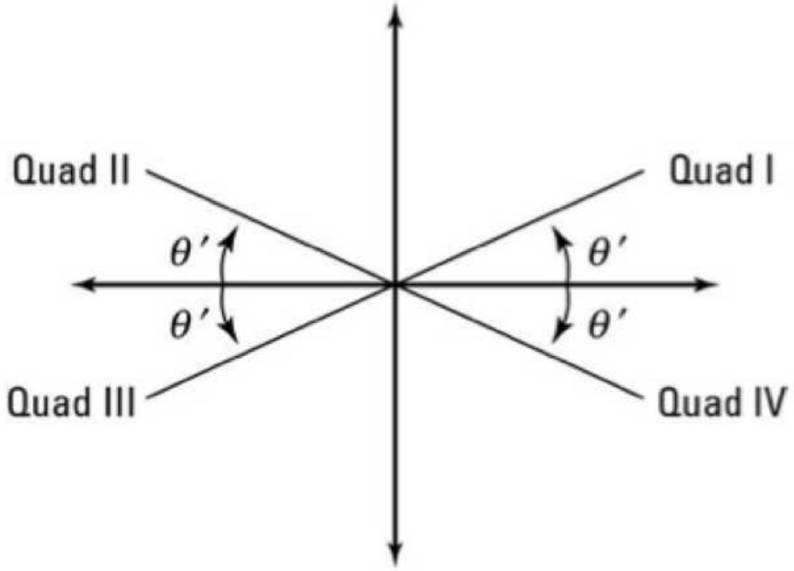
II

b) $\sec\theta < 0$ and $\csc\theta < 0$?

III

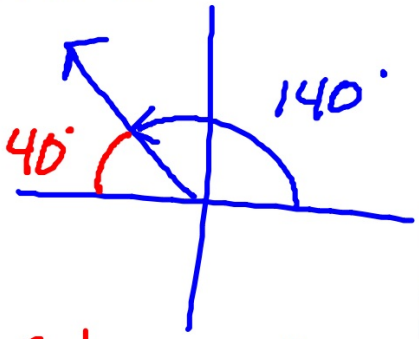
Reference Angles

Let θ be an angle in standard position. The reference angle for θ is the acute angle θ' formed by the terminal side of θ and the closest x-axis.



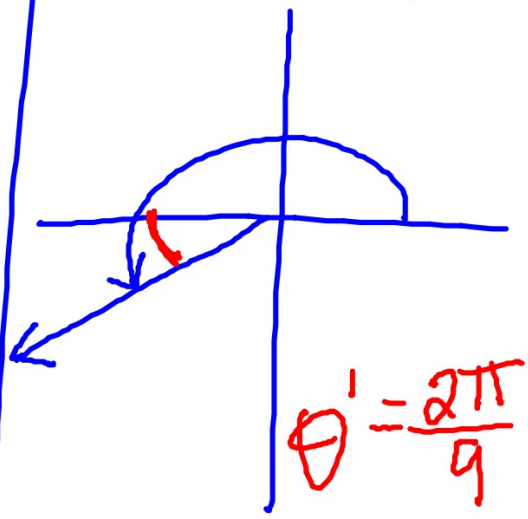
find θ'

a.) $\theta = 140^\circ$



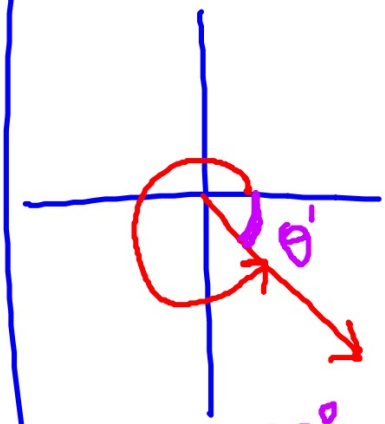
$\theta' = 40^\circ$

b.) $\theta = \frac{11\pi}{9}$



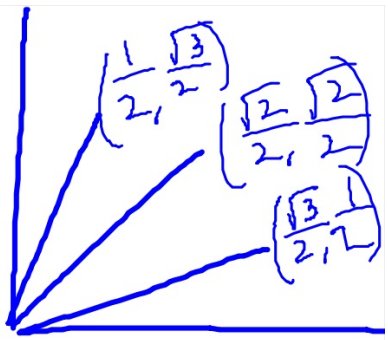
$\theta' = \frac{2\pi}{9}$

c.) 310°



$\theta' = 50^\circ$

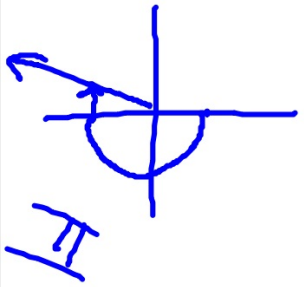
Evaluate. (Quad? θ'?)



a.) $\csc \frac{3\pi}{4} = \sqrt{2}$

Q 2 ; $\theta' = \frac{\pi}{4}$

b.) $\tan\left(\frac{-7\pi}{6}\right) = -\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = -\frac{\sqrt{3}}{3}$



$\theta' = \frac{\pi}{6}$

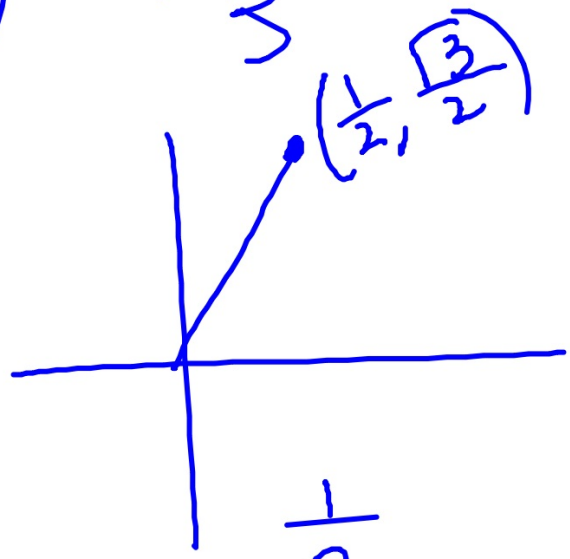
c.) $\cot(-120^\circ) = +\frac{\sqrt{3}}{3}$

Q3

$\theta' = 60^\circ$

$\cot 60^\circ = \frac{\sqrt{3}}{3}$

$\pi/3$



$$\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}}$$

$$\tan\frac{\pi}{6} = \frac{\sqrt{3}}{3}$$

$$\tan\frac{\pi}{3} = \sqrt{3}$$

Evaluate.

a.) $\sin\frac{\pi}{6} = \frac{1}{2}$

b.) $\cos\frac{3\pi}{4} = \frac{-\sqrt{2}}{2}$

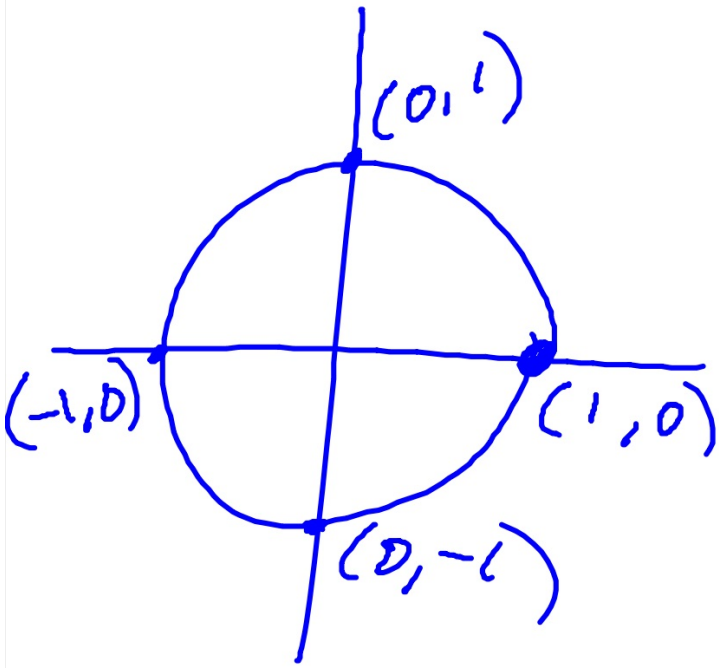
c.) $\sec\frac{7\pi}{6} = \frac{-2}{\sqrt{3}} = \frac{-2\sqrt{3}}{3}$

d.) $\csc\frac{7\pi}{4} = \frac{-2}{\sqrt{2}} = -\sqrt{2}$

e.) $\tan 315^\circ = -1$

f.) $\tan\frac{4\pi}{3} = \frac{-\frac{\sqrt{3}}{2}}{-\frac{1}{2}} = \sqrt{3}$

g.) $\cot 60^\circ = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$



$\cos \pi = -1$

$\sin \pi = 0$

$\tan \pi = \frac{0}{-1} = 0$

$\tan 90^\circ = \frac{1}{0}$ und.

$\csc(-90^\circ) = -1$

$\csc 0^\circ =$ und.

$\sin 720^\circ = 0$