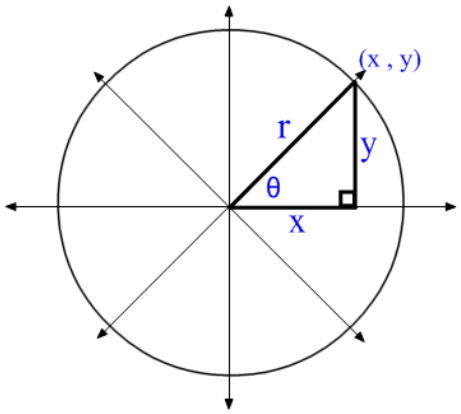
Trig Ratios of ANY Angle (4.3) Analysis Name_____

When θ is in standard position and a perpendicular is dropped from the terminal side of θ to the positive x-axis. The 6 trig ratios can be written as:



$$\sin\theta = \frac{opp}{hyp} = \frac{y}{r} \qquad \csc\theta = \frac{hyp}{opp} = \frac{r}{y}$$

$$\cos\theta = \frac{adj}{hyp} = \frac{x}{r} \qquad \sec\theta = \frac{hyp}{adj} = \frac{r}{x}$$

$$\tan\theta = \frac{opp}{adj} = \frac{y}{x} \qquad \cot\theta = \frac{adj}{opp} = \frac{x}{y}$$

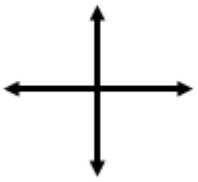
Based on the right triangle above, $\boldsymbol{x^2 + y^2 = r^2}$ **and** $\boldsymbol{r = \sqrt{x^2 + y^2}}$, **where** $\boldsymbol{r > 0}$.

Ex 1: The terminal side of an angle θ in standard position passes through the indicated point. Calculate the values of the 6 trigonometric functions for angle θ.

$\left(\frac{2}{9}, -\frac{1}{3}\right)$

<u>Signs</u> of Trig Functions

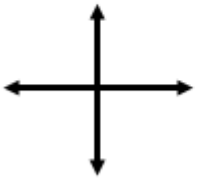
sinθ



Since $\sin\theta = \frac{y}{r}$; $r > O$

Thus $\sin\theta > 0$ *where* $y > 0$ *and* $\sin\theta < 0$ *where* $y < 0$.

cosθ

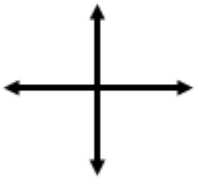


Since $\cos\theta = \frac{x}{r}$; $r > O$

Thus $\cos\theta > 0$ *where* $x > 0$ *and* $\cos\theta < 0$ *where* $x < 0$.

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

tanθ



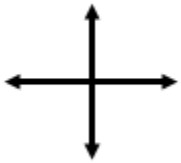
Thus $\tan\theta > 0$ *where* $x > 0$; $y > 0$ *and where* $x < 0$; $y < 0$

And $\tan\theta < 0$ *where* $x > 0$; $y < 0$ *and where* $x < 0$; $y > 0$

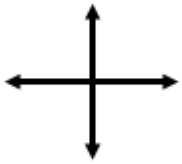
HINT: Associate tan $\boldsymbol{\theta}$ with the slope of a line.

*Given θ in standard position, determine the quadrant in which the terminal side of θ lies.

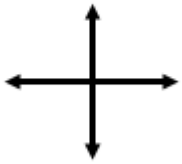
1. $\cos\theta < 0\ ;\ \tan\theta > 0$



2. $\cot\theta < 0\ ;\ \csc\theta < 0$



3. $\sin\theta > 0\ ;\ \sec\theta > 0$



Ex: Given the following constraints, find the remaining trigonometric function values (ratios).

2. $If\ \ \sin\theta = -\frac{7}{25}\ \ and\ \ \tan\theta < 0$

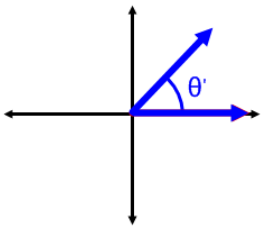
$\sin\theta =$	$\csc\theta$
$\cos\theta$	$\sec\theta$
$\tan\theta$	$\cot\theta$

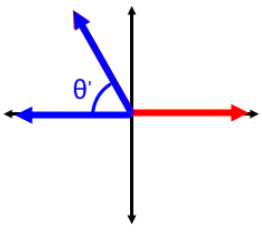
3. $If\ \ \sec\theta = -3\ \ and\ \ \csc\theta > 0$

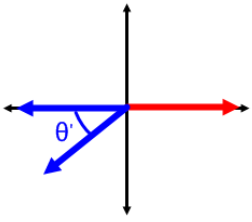
$\sin\theta =$	$\csc\theta$
$\cos\theta$	$\sec\theta$
$\tan\theta$	$\cot\theta$

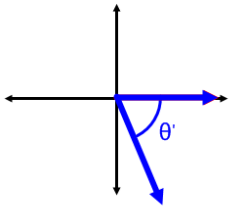
DEFINITION: Reference Angle is a _____, _____(<90°) angle formed by the terminal side of θ and the _____.

The symbol for reference angle is_____.



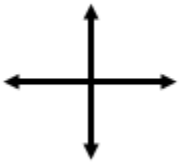




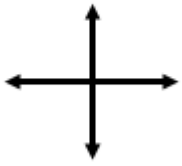


Find the reference angle for θ.

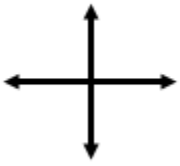
1. $-230°$



2. $\frac{22}{5}\pi$



3. 4.2



4. $-\frac{15}{8}\pi$