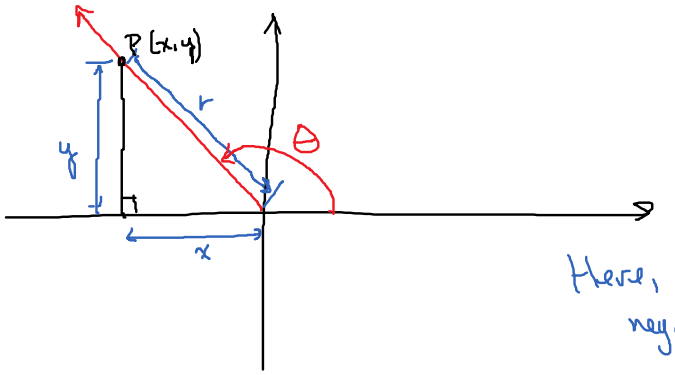
1.3 Trigonometric Functions

For θ in standard position, let P be any point (x,y) on the terminal side of the angle.

Let r be the distance from the origin to point P.

Using distance formula or Pythagorean Theorem, we know that $r = \sqrt{x^2+y^2}$ and $r > 0$.



$x^2 + y^2 = r^2$

$\sqrt{x^2+y^2} = r$

Here, x and y can be negative but r cannot.

The 6 trigonometric functions are:

$\sin\theta = \frac{y}{r}$

$\cos\theta = \frac{x}{r}$

$\tan\theta = \frac{y}{x}$ $(x \neq 0)$

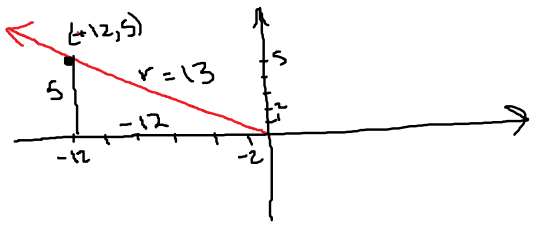
$\csc\theta = \frac{r}{y}$

$\sec\theta = \frac{r}{x}$

$\cot\theta = \frac{x}{y}$ $(y \neq 0)$

Name	Abbreviation
sine	sin
cosine	cos
tangent	tan
cosecant	csc
secant	sec
cotangent	cot

Ex: Terminal side of an angle θ passes through $(-12, 5)$. Find all the trig functions



$r^2 = 5^2 + 12^2$

$r^2 = 25 + 144$

$r^2 = 169$

$r = 13$

$\sin\theta = \frac{y}{r} = \frac{5}{13}$

$\cos\theta = \frac{x}{r} = \frac{-12}{13} = -\frac{12}{13}$

$\tan\theta = \frac{y}{x} = \frac{5}{-12} = -\frac{5}{12}$

$\csc\theta = \frac{r}{y} = \frac{13}{5}$

$\sec\theta = \frac{r}{x} = -\frac{13}{12}$

$\cot\theta = \frac{x}{y} = -\frac{12}{5}$