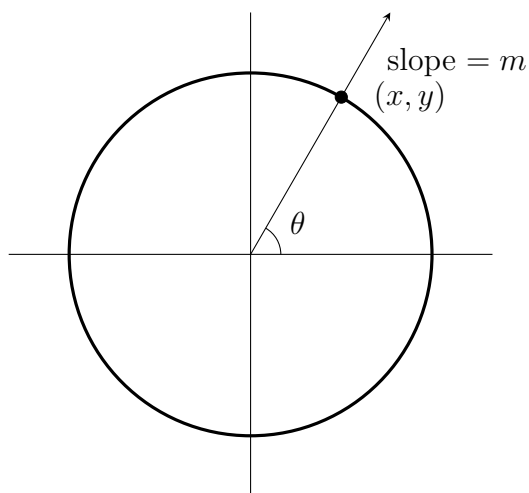


MATH 195: TRIG REFERENCE SHEET

Circles and trig.

The angle θ (“theta”) points in the direction of a ray from the origin, which crosses the unit circle at a point (x, y) . The slope of the ray is m .

$$\begin{aligned}\sin \theta &= y \\ \cos \theta &= x \\ \tan \theta &= m\end{aligned}$$



The less useful trig functions.

There are other, less useful trig functions. You can think of all trig functions in terms of the two most important, sin and cos.

$$\begin{aligned}\tan \theta &= \frac{\sin \theta}{\cos \theta} \\ \cot \theta &= \frac{\cos \theta}{\sin \theta} = \frac{1}{\tan \theta}\end{aligned}$$

$$\begin{aligned}\sec \theta &= \frac{1}{\cos \theta} \\ \csc \theta &= \frac{1}{\sin \theta}\end{aligned}$$

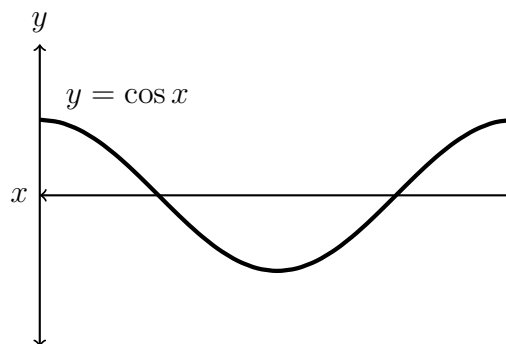
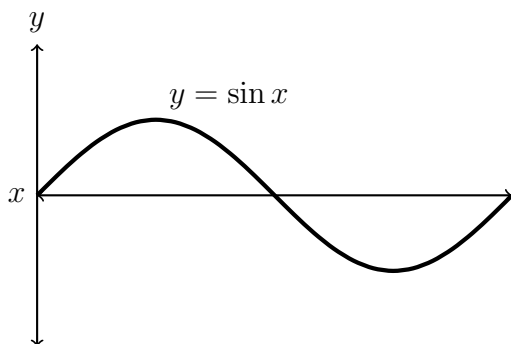
The Pythagorean identity.

Applying the Pythagorean theorem to the right triangle in the unit circle gives the following identity.

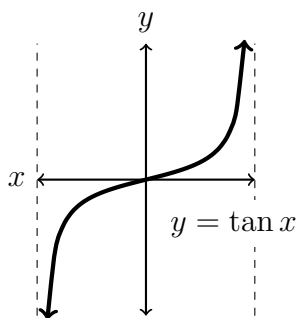
$$\sin^2 \theta + \cos^2 \theta = 1$$

Graphs of $\sin x$ and $\cos x$.

Both $\sin x$ and $\cos x$ have a period of 2π , a maximum of 1, and a minimum of -1 .

**Graph of $\tan x$.**

$\tan x$ has a period of π with asymptotes at the ends of each period.

**Waves.**

\sin and \cos can be used to model waves.

$$y = A \sin(B(t - \varphi)) + C$$

- The *amplitude* $|A|$ is the height from the center to top of the wave.
- The *period* $2\pi/B$ is how long it takes the wave to repeat.
- The *vertical shift* C is the height the wave is centered on.
- φ (“phi”) gives the *phase shift*, where in the wave it starts at time 0. Starting at the top, bottom, or middle of the wave can be done by using $\pm \sin$ or $\pm \cos$.

