Introduction to Trigonometry

We start with a circle of radius $r$. The circumference is $C = 2\pi r$. The area is $A = \pi r^2$.

Radians vs Degrees:

If $L$ is the length of the arc subtended by the angle $t$, then $t = \frac{L}{r}$ radians.

Note that $L$ and $r$ have the same units so $t$ has no units.

The whole circle is $2\pi$ radians and is 360 degrees. So $1^\circ = \frac{2\pi}{360}$ radians = $\frac{\pi}{180}$ radians.

Set your calculator to radians using the MODE key.

The Pythagorean Theorem:

\[a^2 + b^2 = c^2\]

Definition of $\sin(t)$ and $\cos(t)$: When $c = 1$, $\cos(t) = a$, the side adjacent to angle $t$, $\sin(t) = b$, the side opposite angle $t$.

By the Pythagorean theorem, $\sin^2(t) + \cos^2(t) = 1$

Note: $\sin^2(t)$ means $(\sin(t))^2$ but $\sin^{-1}(t)$ does not mean $(\sin(t))^{-1}$. We will discuss this more later.

Use your calculator to view the graphs of $\sin(t)$ and $\cos(t)$ in the window $x\text{Min} = -6\pi$, $x\text{Max} = 6\pi$, $y\text{Min} = -1.5$, $y\text{Max} = 1.5$

Other trig functions $\tan(t) = \frac{\sin(t)}{\cos(t)}$ $\sec(t) = \frac{1}{\cos(t)}$

Find their domains and graph each in the window used for $\sin(t)$ and $\cos(t)$.

Note: The triangles are similar.

\[\cos^2 t + \sin^2 t = 1\]

\[1 + \tan^2 t = \sec^2 t\]