

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.

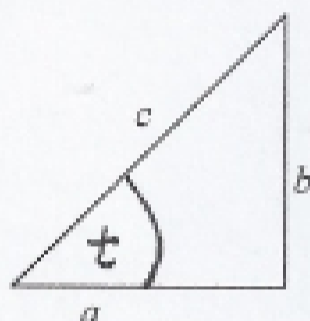
Note that  $L$  and  $r$  have the same units so  $t$  has no units.

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

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  $t$ .

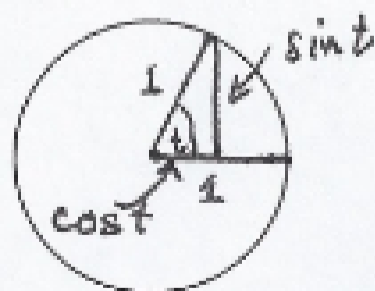
By the Pythagorean theorem,  $\sin^2(t) + \cos^2(t) = 1$

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

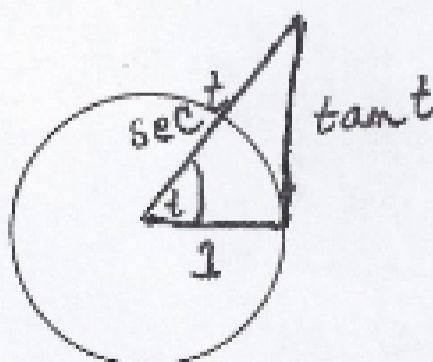
Use your calculator to view the graphs of  $\sin(t)$  and  $\cos(t)$  in the window  $x\text{Min} = -6\pi$ ,  $x\text{Max} = 6\pi$ ,  $y\text{Min} = -1.5$ ,  $y\text{Max} = 1.5$

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  $\cos(t)$ .



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



$$1 + \tan^2 t = \sec^2 t$$

Note: The triangles are similar.