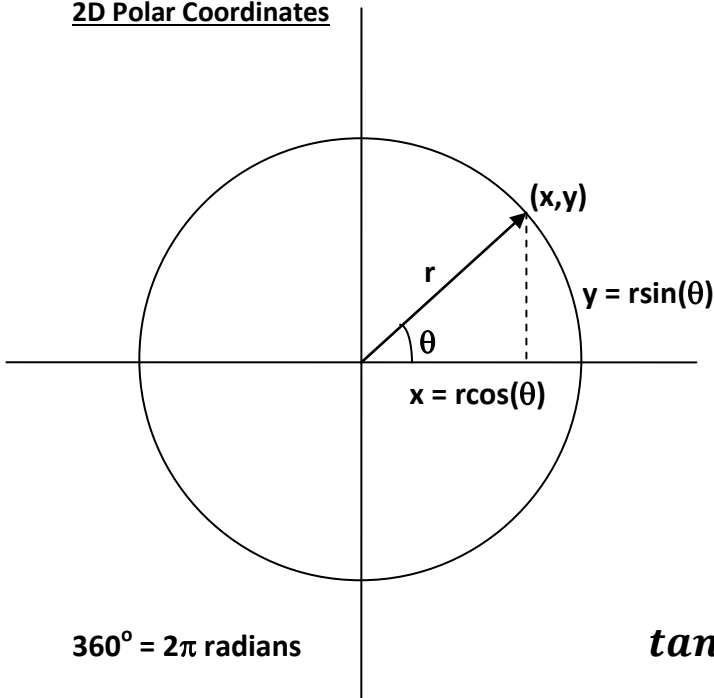


SOHCAHTOA: Sine=Opp/Hyp Cosine=Adj/Hyp Tan=Opp/Adj

2D Polar Coordinates



$$360^\circ = 2\pi \text{ radians}$$

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

$$r^2 \cos^2(\theta) + r^2 \sin^2(\theta) = r^2$$

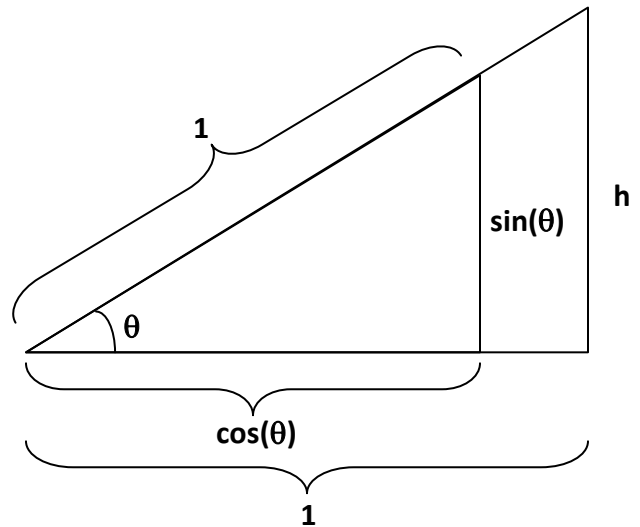
$$\boxed{\cos^2(\theta) + \sin^2(\theta) = 1}$$

$$\frac{\sin^2(\theta)}{\cos^2(\theta)} + \frac{\cos^2(\theta)}{\cos^2(\theta)} = \frac{1}{\cos^2(\theta)}$$

$$\boxed{\tan^2(\theta) + 1 = \sec^2(\theta)}$$

θ	Sin(θ)	Cos(θ)
0	0	1
$\pi/6$	1/2	$\sqrt{3}/2$
$\pi/4$	$\sqrt{2}/2$	$\sqrt{2}/2$
$\pi/3$	$\sqrt{3}/2$	1/2
$\pi/2$	1	0

From Unit Circle:

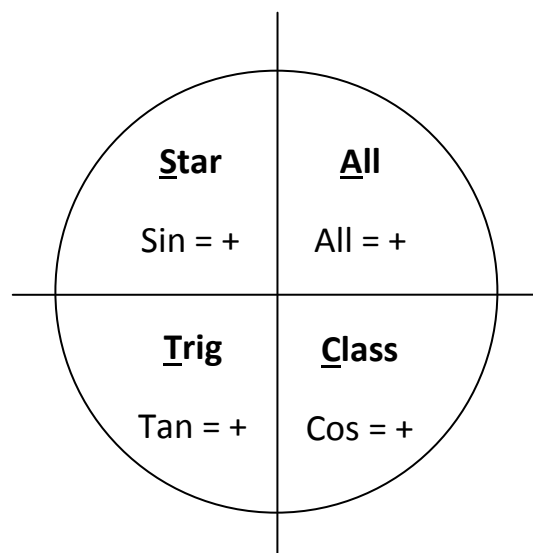


$$\tan(\theta) = \frac{h}{1} \text{ and } \tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)}$$

$$\text{Similar Triangles: } \frac{\sin(\theta)}{\cos(\theta)} = \frac{h}{1}$$

Common Degree to Radian Conversions:

Degrees	Radians
0	0
30	$\pi/6$
45	$\pi/4$
60	$\pi/3$
90	$\pi/2$



Reciprocal and Inverse functions:

$$\sec(x) = \frac{1}{\cos(x)}, \quad \csc(x) = \frac{1}{\sin(x)}, \quad \cot(x) = \frac{1}{\tan(x)}$$

If $\sin(\theta) = x$, then $\theta \neq x/\sin$. Sine is a function, therefore, you have to take the inverse to solve for θ : $\theta = \sin^{-1}(x) = \arcsin(x) = \text{asin}(x)$.

Double Angle Formulas:

$$\sin(2\theta) = 2\sin(\theta)\cos(\theta)$$

$$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta) = \cos^2(\theta) - (1 - \cos^2(\theta)) = 2\cos^2(\theta) - 1$$

$$\tan(2\theta) = \frac{2\tan(\theta)}{1 - \tan^2(\theta)}$$

Angle Addition Formulas:

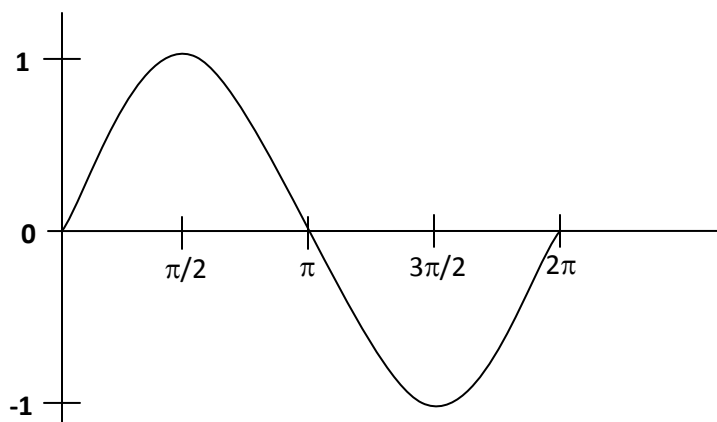
$$\sin(a \pm b) = \sin(a)\cos(b) \pm \sin(b)\cos(a)$$

$$\cos(a \pm b) = \cos(a)\cos(b) \mp \sin(a)\sin(b)$$

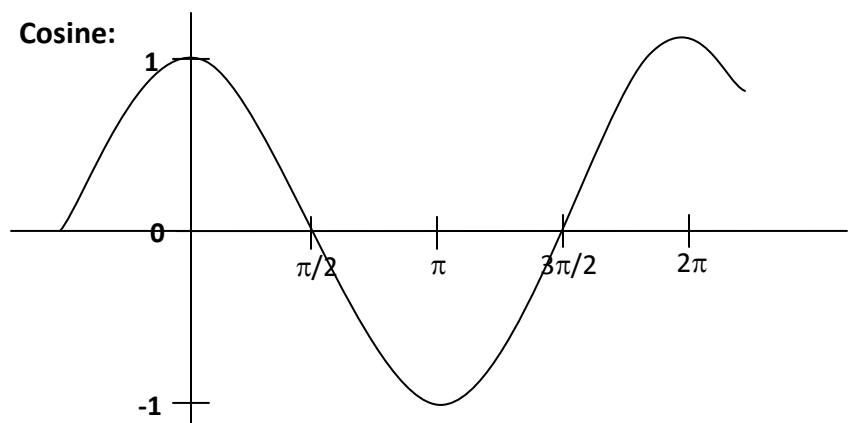
$$\tan(a \pm b) = \frac{\tan(a) \pm \tan(b)}{1 \mp \tan(a)\tan(b)}$$

Trig Function Graphs:

Sine:



Cosine:



In general: $A+B\cos(\omega t+\phi)$

A: Shifts the graph up (+) or down (-) along the y-axis.

B: Amplitude of the wave. Shrink (small) and stretch (large) along the y-axis.

ω : Frequency of the wave. Shrink (large) and stretch (small) along the x-axis.

ϕ : Shifts the graph right (-) and left (+) along the x-axis. (ex: $\sin(\theta) = \cos(\theta-90^\circ)$)

T: Period of the wave. $T = 2\pi/\omega$