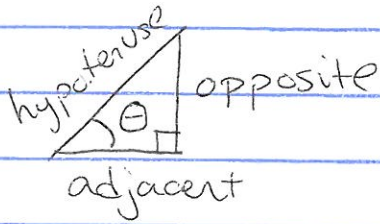


Some Trig Basics



$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

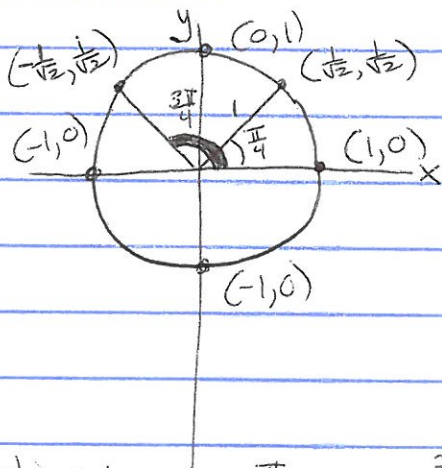
$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}} \Rightarrow \tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$x^2 + y^2 = 1 \quad \text{unit circle}$$

If $x = \cos \theta$ and $y = \sin \theta$ we get

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

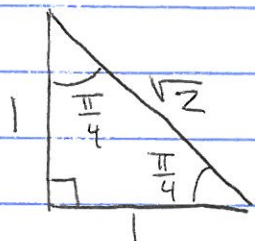


The unit circle is helpful for determining the sign of $\sin$, $\cos$. Google it for a more filled in version.

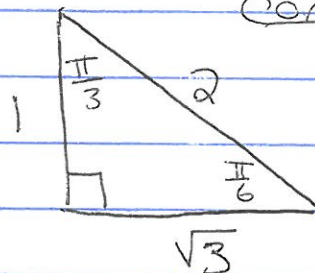
Notice! $\sin \frac{\pi}{4} = \sin \frac{3\pi}{4}$ (y values are the same)
 $(\pi - \frac{\pi}{4})$
 but $\cos \frac{\pi}{4} = -\cos \frac{3\pi}{4}$ (x values are different)

* To convert from degrees to radians multiply by $\frac{\pi}{180}$
 To convert from radians to degrees multiply by $\frac{180}{\pi}$

Use these triangles to find $\sin$ & $\cos$ of common angles.



Note! $\frac{\pi}{4} = 45^\circ$



$\frac{\pi}{3} = 60^\circ$, $\frac{\pi}{6} = 30^\circ$

$$\cos \frac{\pi}{4} = \frac{\text{adj}}{\text{hyp}} = \frac{1}{\sqrt{2}}$$

Or $\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

What do we think about radicals in the denominator?

Liberating!

$$\sin \frac{\pi}{4} = \frac{\text{opp}}{\text{hyp}} = \frac{1}{\sqrt{2}}$$

$$\tan \frac{\pi}{4} = \frac{\text{opp}}{\text{adj}} = \frac{1}{1} = 1$$

$$\cos \frac{\pi}{3} = \frac{\text{adj}}{\text{hyp}} = \frac{1}{2}$$

$$\tan \frac{\pi}{3} = \frac{\text{opp}}{\text{adj}} = \frac{\sqrt{3}}{1}$$

$$\sin \frac{\pi}{3} = \frac{\text{opp}}{\text{hyp}} = \frac{\sqrt{3}}{2}$$

$$\sin \frac{\pi}{6} = \frac{\text{opp}}{\text{hyp}} = \frac{1}{2}$$

$$\cos \frac{\pi}{6} = \frac{\text{adj}}{\text{hyp}} = \frac{\sqrt{3}}{2}$$

* The unit circle is also good for finding $\sin$ & $\cos$ of 0 , $\frac{\pi}{2}$ (90°), π (180°), $\frac{3\pi}{2}$ (270°), 2π (360°)

Recipricals: $\sin \theta = \frac{1}{\csc \theta}$ $\cos \theta = \frac{1}{\sec \theta}$
 $\tan \theta = \frac{1}{\cot \theta}$

I think it is easier to remember like this

$\sin \theta$
 $\cos \theta$
 $\tan \theta$
 $\cot \theta$
 $\sec \theta$
 $\csc \theta$

Derivatives:

$$\frac{d}{dx}(\sin x) = \cos x$$

$$\frac{d}{dx}(\cos x) = -\sin x$$

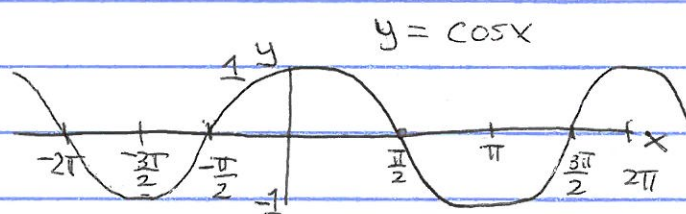
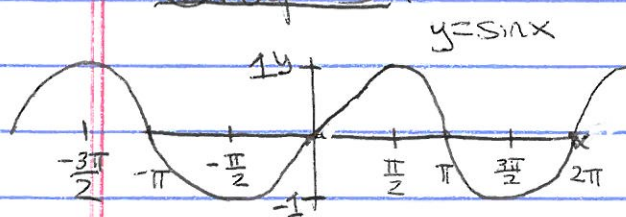
$$\frac{d}{dx}(\tan x) = \sec^2 x$$

$$\frac{d}{dx}(\cot x) = -\csc^2 x$$

$$\frac{d}{dx}(\sec x) = \sec x \tan x$$

$$\frac{d}{dx}(\csc x) = -\csc x \cot x$$

Graphs:



Note: $-1 \leq \sin x \leq 1$
for every value of x .

$-1 \leq \cos x \leq 1$ for all x

We can see $\sin 0 = 0$
 $\sin \pi/2 = 1$, $\sin \pi = 0$, etc

$\cos 0 = 1$ $\cos \pi/2 = 0$ $\cos \pi = -1$, etc

1/2 Angle Identities:

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

$$\sin^2 x = \frac{1}{2}(1 - \cos(2x))$$