3.3: The Unit Circle and Circular Functions

We have: $\sin\theta = \frac{y}{r}$ | On unit circle, $r=1$, so $\sin\theta = y$

$\cos\theta = \frac{x}{r}$ | $\cos\theta = x$

$\tan\theta = \frac{y}{x}$ | $\tan\theta = \frac{y}{x}$

Remember that θ in radians is the number of radii of arc length intercepted by θ

From Section 3.2: arc length is $s = r\theta$

(s = arclength, r = radius)

θ = central angle in radian measure.

If $r=1$, then the arclength s is θ (in radians)

Circular Function definitions

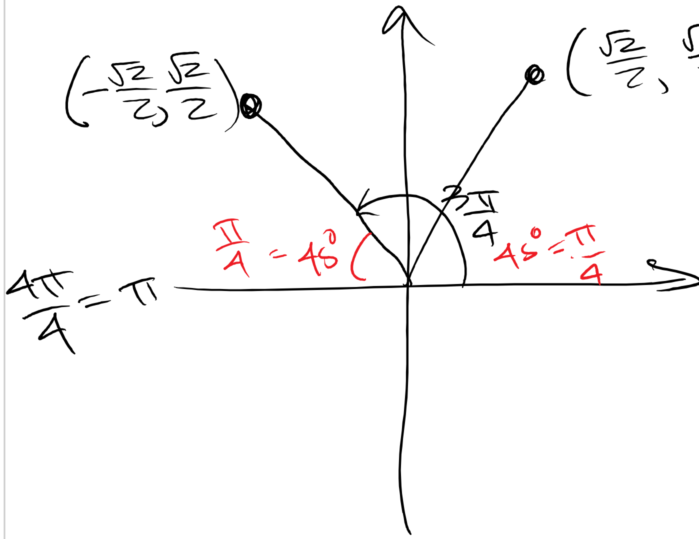
For any real number s represented by an arc on the unit circle, we have:

$$\boxed{\begin{array}{lll} \sin s = y & \cos s = x & \tan s = \frac{y}{x} \\ \csc s = \frac{1}{y} & \sec s = \frac{1}{x} & \cot s = \frac{x}{y} \end{array}}$$

Note: s is a directed arc, meaning it has direction as well as size (positive goes counterclockwise)

(negative goes clockwise)

Ex: Find $\sin(\theta)$ and $\tan(\theta)$ for $\theta = \frac{3\pi}{4}$.



$\frac{\pi}{4} = 45°$

$$\boxed{\sin(\theta) = \sin\left(\frac{3\pi}{4}\right) = \frac{\sqrt{2}}{2}}$$

$$\tan(\theta) = \tan\left(\frac{3\pi}{4}\right) = \frac{\sqrt{2}/2}{-\sqrt{2}/2}$$

$$\boxed{\tan\left(\frac{3\pi}{4}\right) = -1}$$

Put your calculator in radian mode.

Ex: $\boxed{\cos(3.14) \approx -0.99999873 2}$

Ex: $\sin(1) \approx \boxed{0.84147}$

Ex: Find $\sec(0.65)$.

$$\cos(0.65) \approx 0.79608$$

$$\sec(0.65) = \frac{1}{\cos(0.65)} \approx \boxed{1.256149}$$

<u>Ex</u>: Find the value of s in $[0, \frac{\pi}{2})$ so that

$\tan s = 0.2126$.

$s = \tan^{-1}(0.2126) \approx \boxed{0.20948}$