

§6.2 Trigonometric Functions: The Unit Circle

Discuss the Unit Circle.

The Trigonometric Functions

Let t be a real number and let (x, y) be the point on the unit circle corresponding to t .

$$\sin t = y \qquad \csc t = \frac{1}{y} \quad (y \neq 0)$$

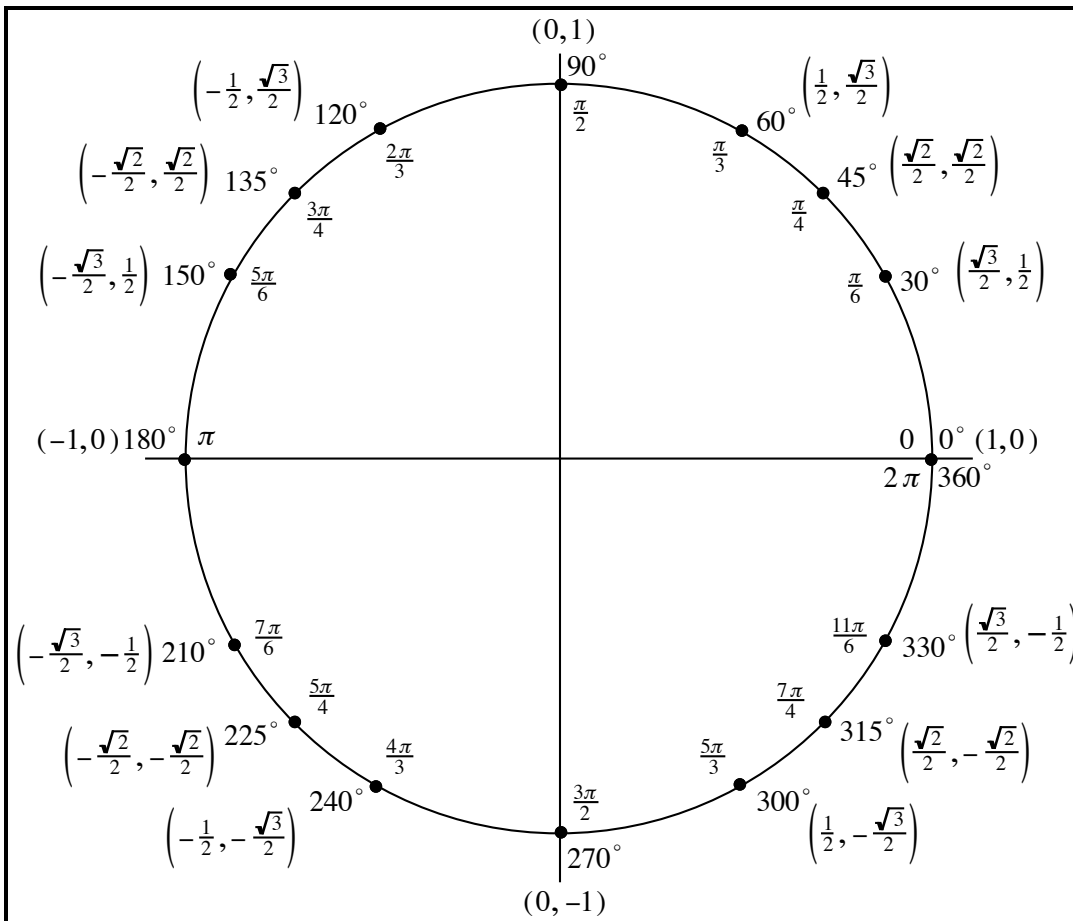
$$\cos t = x \qquad \sec t = \frac{1}{x} \quad (x \neq 0)$$

$$\tan t = \frac{y}{x} \quad (x \neq 0) \qquad \cot t = \frac{x}{y} \quad (y \neq 0)$$

The Unit Circle

Find the the six trig values using a point on the unit

circle: Let $P = \left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$



$$(x, y) = (\cos \theta, \sin \theta)$$

Example Evaluate the six trig functions at each real number.

a) $t = \frac{\pi}{2}$

b) $t = \frac{5\pi}{4}$

c) $t = \pi$

Examples: Find a) $\tan \frac{\pi}{4} - \sin \frac{3\pi}{2}$

Examples: Find a) $\sin 135^\circ$ b) $\cos -\frac{7\pi}{2}$

Discuss using a calculator.

Find $\cos 48^\circ$ $\csc 21^\circ$

Definitions of Trigonometric Functions of Any Angle

Let θ be an angle in standard position with (x, y) a point on the terminal side of θ and

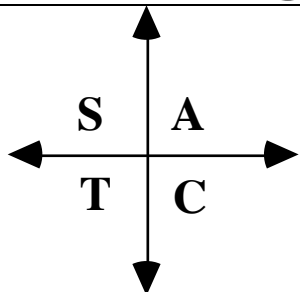
$$r = \sqrt{x^2 + y^2} \neq 0.$$

$$\sin \theta = \frac{y}{r} \quad \cos \theta = \frac{x}{r} \quad \tan \theta = \frac{y}{x}, \quad (x \neq 0)$$

$$\csc \theta = \frac{r}{y}, \quad (y \neq 0) \quad \sec \theta = \frac{r}{x}, \quad (x \neq 0)$$

$$\cot \theta = \frac{x}{y}, \quad (y \neq 0)$$

Signs of Trigonometric Functions



"All Students Take Calculus"

Quad I - $\sin \theta$, $\cos \theta$, $\tan \theta$ are positive

Quad II - $\sin \theta$ is positive; $\cos \theta$, $\tan \theta$ are negative

Quad III - $\tan \theta$ is positive; $\sin \theta$, $\cos \theta$ are negative

Quad IV - $\cos \theta$ is positive; $\sin \theta$, $\tan \theta$ are negative

Example 1 Let $(4, -3)$ be a point on the terminal side of θ . Find the sine, cosine, and tangent of θ .