

# Trigonometry

## Basic Trigonometric Functions

Reference Angle: The acute angle between x-axis and the terminal side (always positive)

$$\begin{aligned} \sin &= \frac{y}{r} & \csc &= \frac{r}{y} \\ \cos &= \frac{x}{r} & \sec &= \frac{r}{x} \\ \tan &= \frac{y}{x} & \cot &= \frac{x}{y} \end{aligned}$$

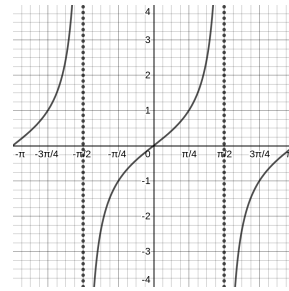
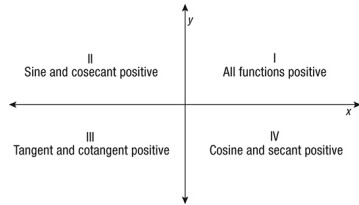


Figure 3:  $y = \tan(x)$

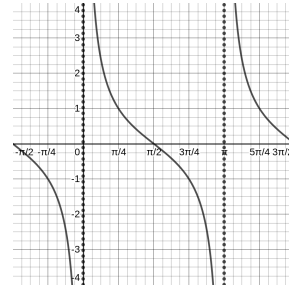


Figure 4:  $y = \cot(x)$

## Graphing Trigonometric Functions

Assume...

- $y = d + a * \text{trig}(bx - c)$
- Amplitude =  $|a|$
- Vertical Shift =  $d$
- Phase Shift =  $\frac{c}{b}$
- X-Scale (change between critical points) =  $\frac{\text{period}}{4}$
- Period depends on what functions
- $\sin, \cos, \csc, \sec = \frac{2\pi}{b}$
- $\tan, \cot = \frac{\pi}{b}$

Examples...

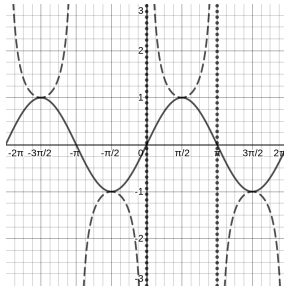


Figure 1:  $y = \sin(x), y = \csc(x)$

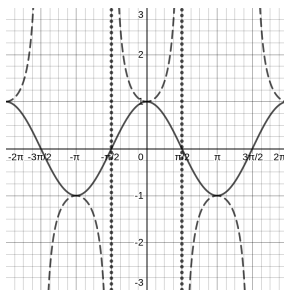


Figure 2:  $y = \cos(x), y = \sec(x)$

## Trigonometric Identities

$$\begin{aligned} \sin &= \frac{1}{\csc} & \csc &= \frac{1}{\sin} \\ \cos &= \frac{1}{\sec} & \sec &= \frac{1}{\cos} \\ \tan &= \frac{\sin}{\cos} & \cot &= \frac{\cos}{\sin} \end{aligned}$$

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

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

$$1 + \cot^2 = \csc^2$$

## Arcs

In **radians** unless specified otherwise

Exact  $\Rightarrow$  picture

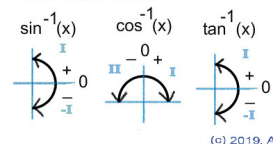
Round  $\Rightarrow$  calculator ( $\sin^{-1}$ )

$$\sin(\theta) = -\frac{\sqrt{3}}{2}$$

$$\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$$

$$\arcsin\left(-\frac{\sqrt{3}}{2}\right)$$

Arc function results



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