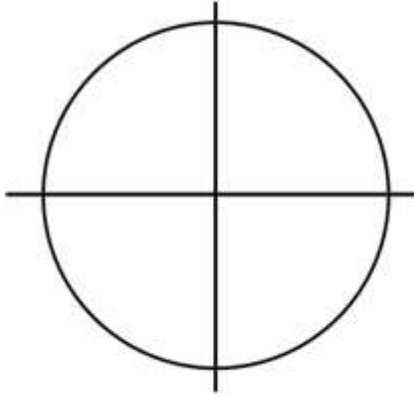


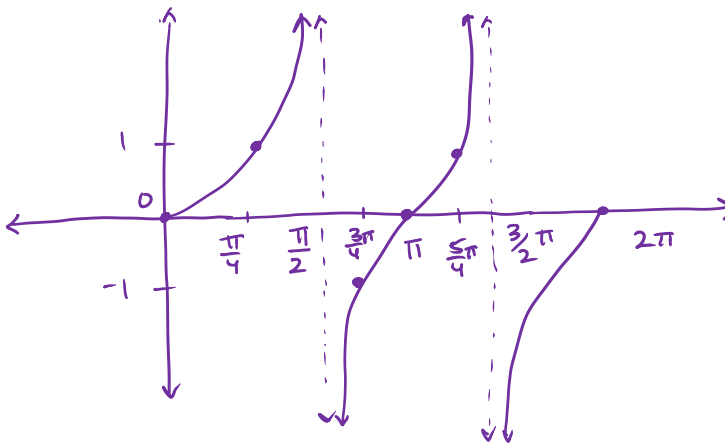
# GRAPHS OF TANGENT AND RECIPROCAL FUNCTIONS

- OBJECTIVES:** 1) Graph the tangent, secant, cosecant, and cotangent mother functions.  
2) Graph transformations of these functions and determine phase shifts and periods.

## GRAPH OF $Y=TAN(X)$



x	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	$\pi$
sin(x)	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
cos(x)	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	1
tan(x)	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	UN-Defined	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	0



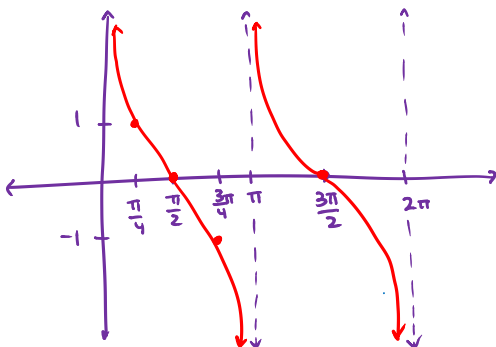
Amplitude: **undefined (none)**

Period:  $\pi$

Domain:  $\mathbb{R}$  except  $\pm \frac{\pi}{2}, \pm \frac{3\pi}{2}, \dots$

Range:  $\mathbb{R} (-\infty, \infty)$

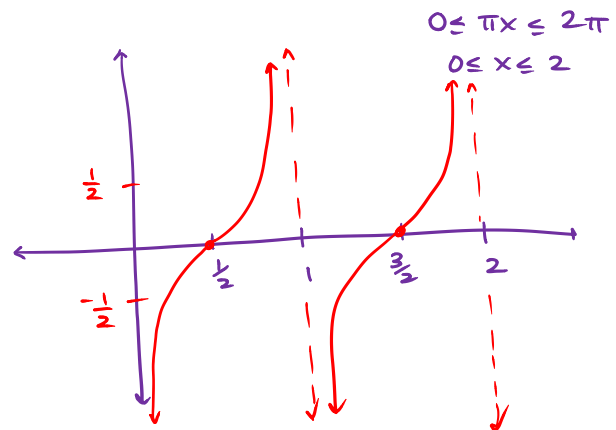
## GRAPH OF $Y=COT(X)$



Amplitude: **undefined** Period:  $\pi$

Domain:  $\mathbb{R}$  except  $0, \pm \pi, \pm 2\pi, \dots$  Range:  $\mathbb{R} (-\infty, \infty)$

- 1) Sketch the graph of  $y = -\frac{1}{2} \cot(\pi x)$

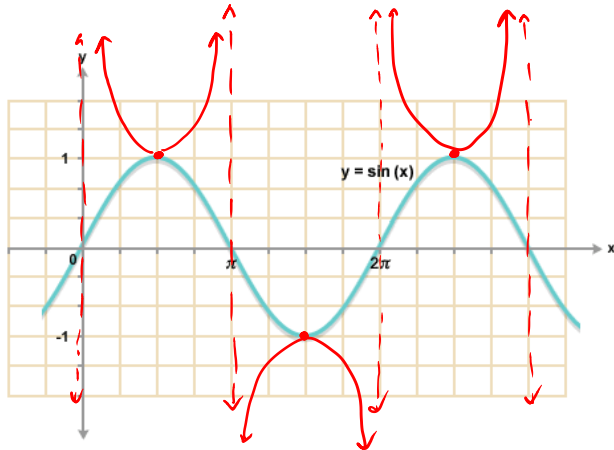


Period: **1**

Phase Shift: **none**

## GRAPH OF $Y = \csc(x)$

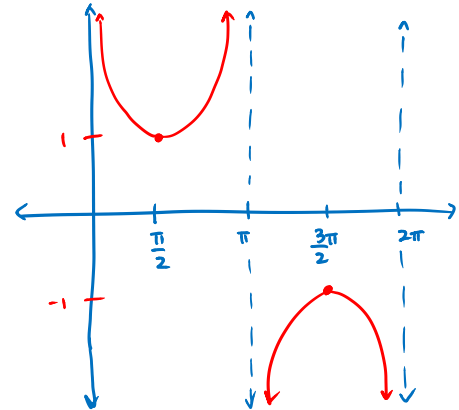
$$y = \csc(x) = \frac{1}{\sin(x)}$$



Amplitude: *undefined* Period:  $2\pi$

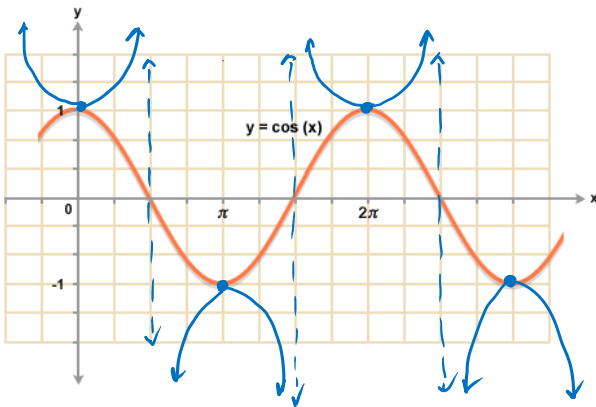
Domain:  $\mathbb{R}$  except  $0, \pm\pi, \pm 2\pi, \dots$  Range:  $(-\infty, -1] \cup [1, \infty)$

(ODD FUNCTION)



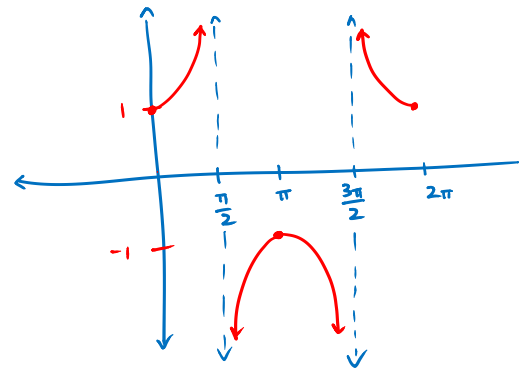
## GRAPH OF $Y = \sec(x)$

$$y = \sec(x) = \frac{1}{\cos(x)}$$

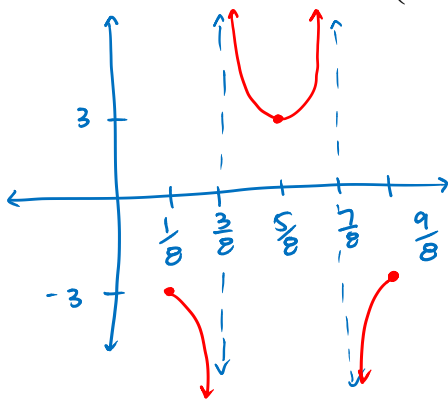


Amplitude: *undefined* Period:  $2\pi$

Domain:  $\mathbb{R}$  except  $\pm\frac{\pi}{2}, \pm\frac{3\pi}{2}, \dots$  Range:  $(-\infty, -1] \cup [1, \infty)$



2) Sketch the graph of  $y = -3\sec\left(2\pi x - \frac{\pi}{4}\right)$



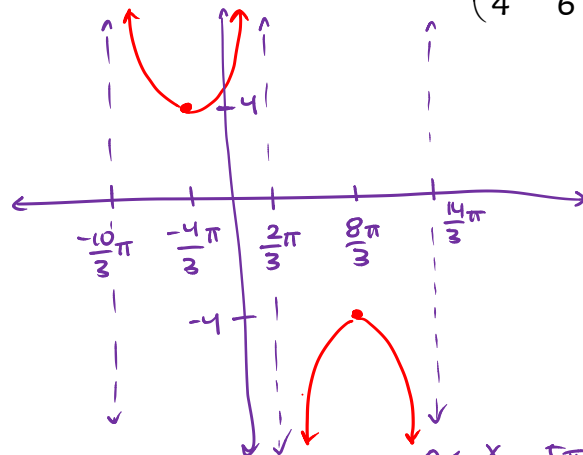
Period: 1  
Phase Shift:  $\frac{1}{8}$

$$0 \leq 2\pi x - \frac{\pi}{4} \leq 2\pi$$

$$\frac{\pi}{4} \leq 2\pi x \leq \frac{9\pi}{4}$$

$$\frac{1}{8} \leq x \leq \frac{5}{8}$$

3) Sketch the graph of  $y = 4\csc\left(\frac{x}{4} + \frac{5\pi}{6}\right)$



Period:  $8\pi$   
Phase Shift:  $-\frac{10\pi}{3}$

$$0 \leq \frac{x}{4} + \frac{5\pi}{6} \leq 2\pi$$

$$-\frac{5\pi}{6} \leq \frac{x}{4} \leq \frac{7\pi}{6}$$

$$-\frac{10\pi}{3} \leq x \leq \frac{14\pi}{3}$$