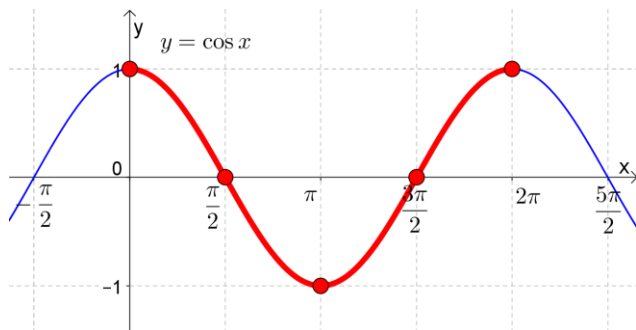
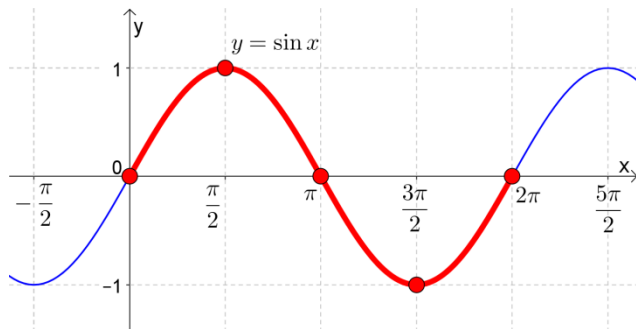


Trigonometric Graphs

(covers Sullivan 6.4, 6.5, and 6.6)

Here are the graphs of $\sin x$ and $\cos x$.

Both functions have a period of 2π , since $\sin x = \sin(x + 2\pi)$ and $\cos x = \cos(x + 2\pi)$.



We can apply transformations to these functions and we give names to the resulting characteristics.

$$y = a \sin k(x - b) \qquad y = a \cos k(x - b)$$

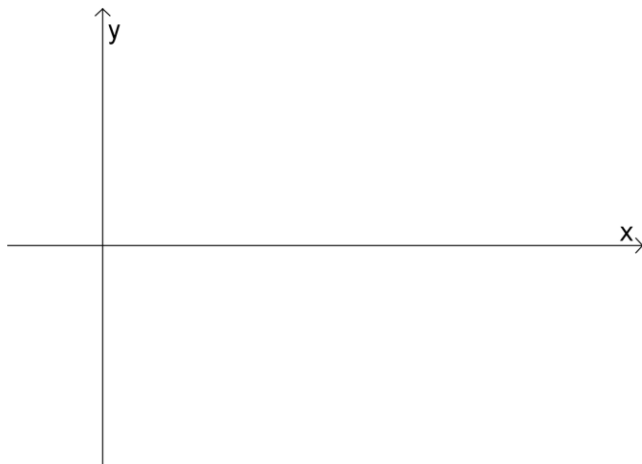
$|a|$ is called the _____

$\frac{2\pi}{k}$ is called the _____

b is called the _____

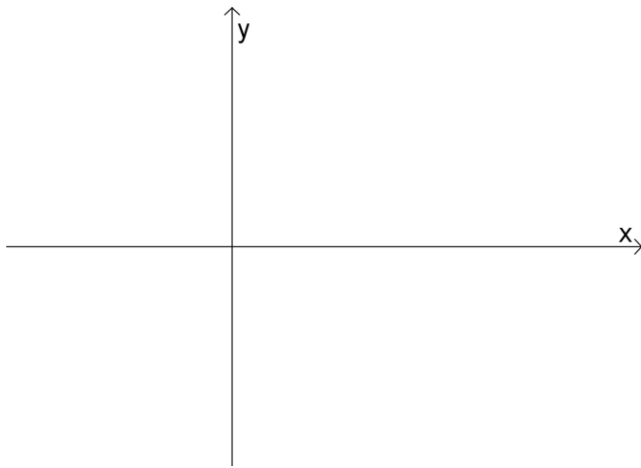
Ex 1.

Find the amplitude, period, and phase shift of $y = 3 \sin 2\left(x - \frac{\pi}{4}\right)$ and graph one complete period.

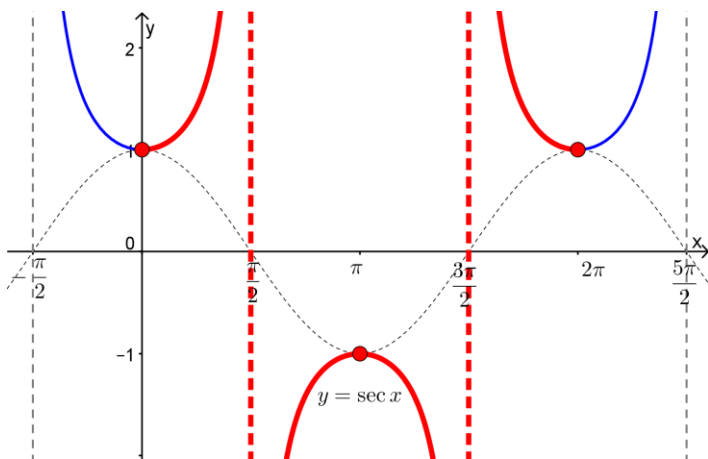
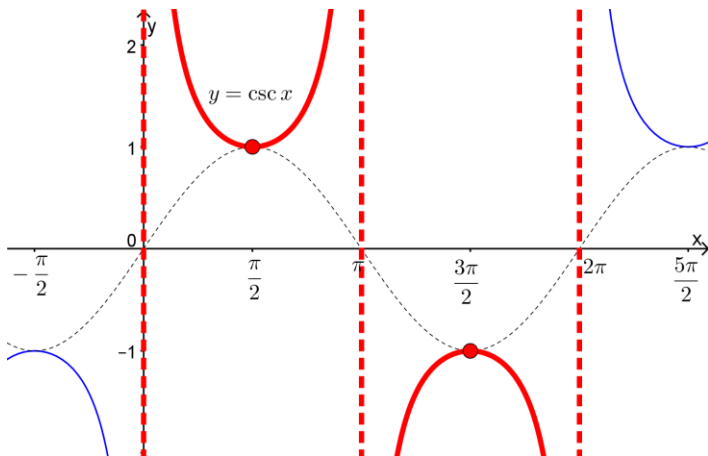


Ex 2.

Find the amplitude, period, and phase shift of $y = \frac{3}{4} \cos\left(2x + \frac{2\pi}{3}\right)$ and graph one complete period.



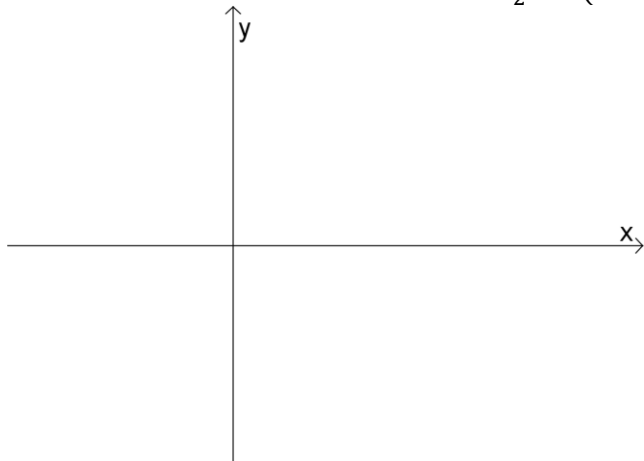
Here are the graphs of $\csc x$ and $\sec x$. Remember that $\csc x = \frac{1}{\sin x}$ and $\sec x = \frac{1}{\cos x}$



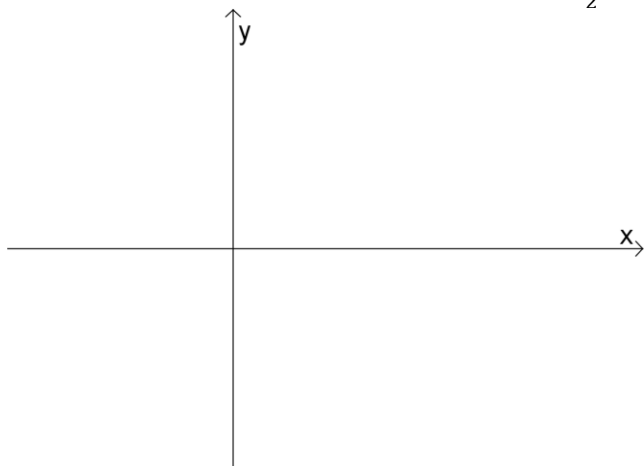
For $y = a \csc k(x - b)$ and $y = a \sec k(x - b)$, the period is $\frac{2\pi}{k}$ and the phase shift is b .

Ex 3.

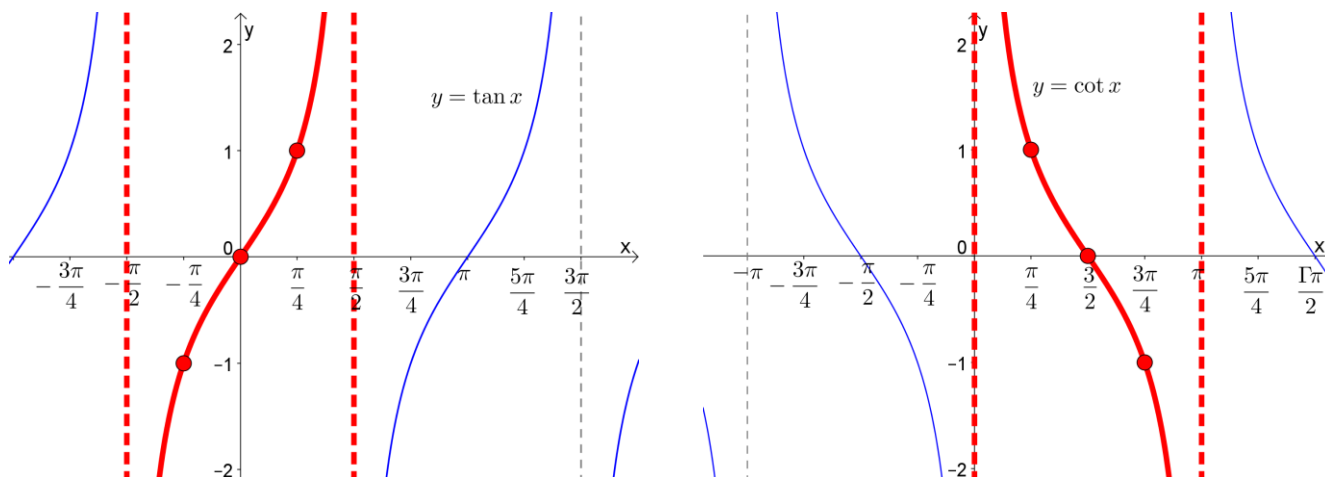
Find the period and phase shift of $y = \frac{1}{2} \csc\left(2x + \frac{\pi}{2}\right)$ and graph one complete period.

**Ex 4.**

Find the period and phase shift of $y = 3 \sec\frac{1}{2}x$ and graph one complete period.



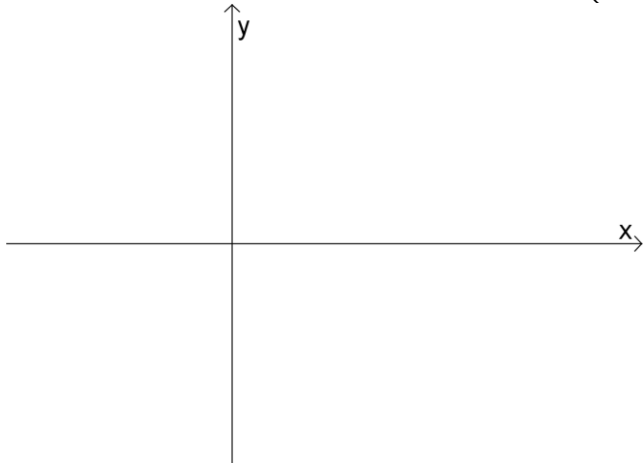
And here are the graphs of $\tan x$ and $\cot x$. Note that the period of $\tan x$ and $\cot x$ is π . Normally, we draw a period of $\tan x$ from $-\frac{\pi}{2}$ to $\frac{\pi}{2}$ and a period of $\cot x$ from 0 to π .



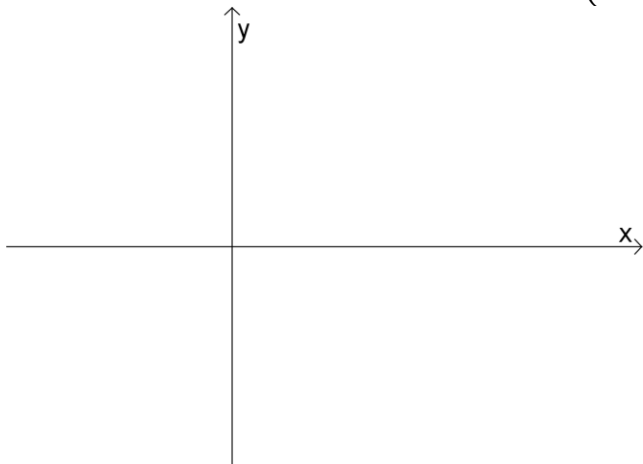
For $y = a \tan k(x - b)$ and $y = a \cot k(x - b)$, the period is $\frac{\pi}{k}$ and the phase shift is b .

Ex 5.

Find the period and phase shift of $y = \tan 2\left(x - \frac{\pi}{4}\right)$ and graph one complete period.

**Ex 6.**

Find the period and phase shift of $y = 2 \cot\left(3x - \frac{\pi}{2}\right)$ and graph one complete period.



Lastly, let's look at how to handle vertical shifts.

Ex 7.

Find the amplitude, period, and phase shift of $y = -2 \cos\left(x - \frac{\pi}{2}\right) + 3$ and graph one complete period.

