L3 – 5.1/5.2 Graphing Trig Functions
MHF4U

Part 1: Remember the Unit Circle

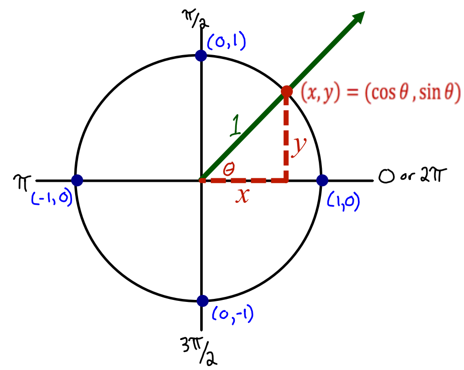
The unit circle is a circle is a circle that is centered at the origin and has a radius of ________. On the unit circle, the sine and cosine functions take a simple form:

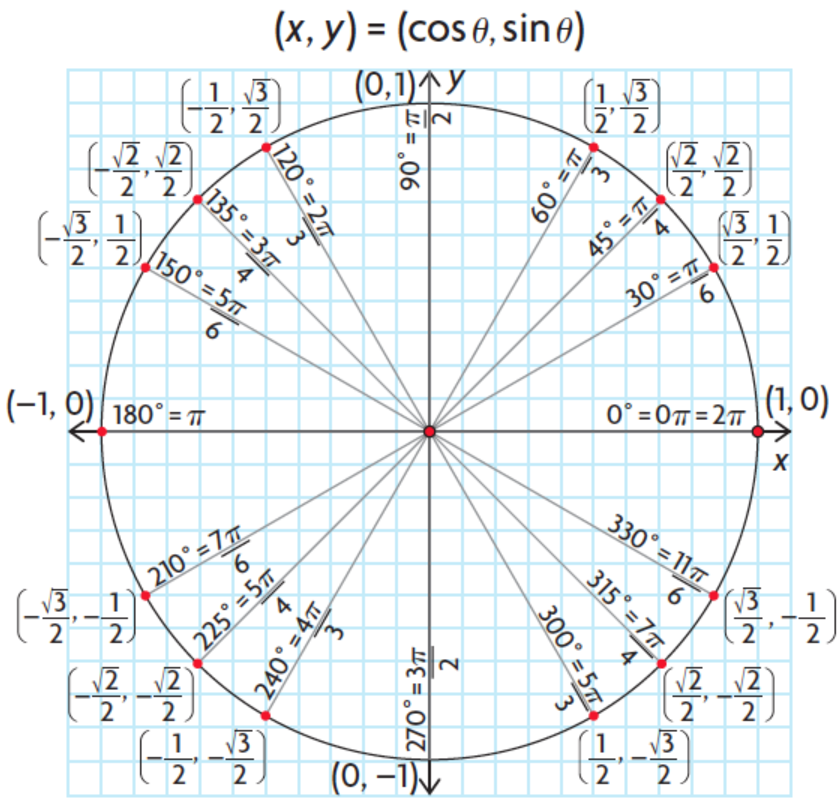
$\sin\theta =$

$\cos\theta =$

The value of $\sin\theta$ is the ________________ of each point on the unit circle

The value of $\cos\theta$ is the ________________ of each point on the unit circle



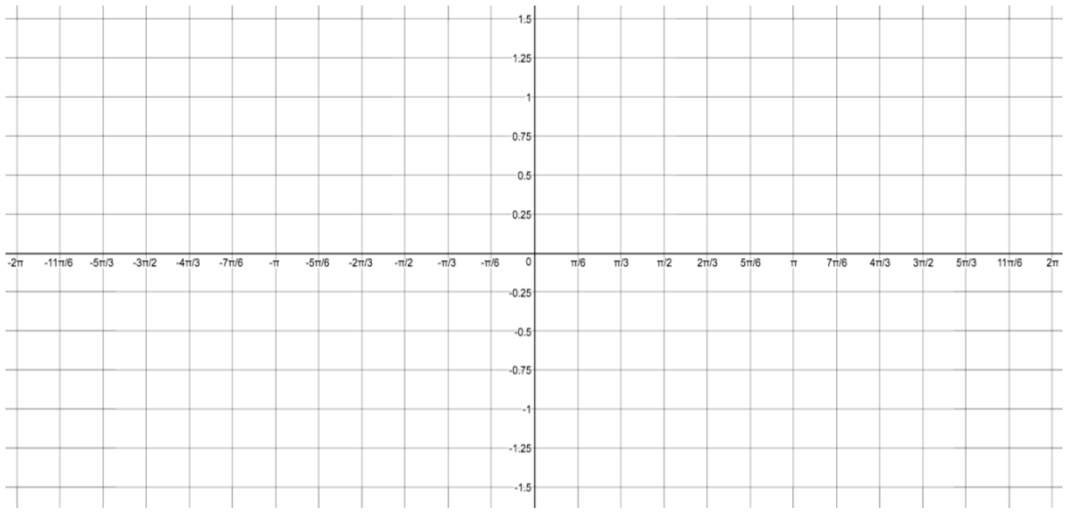


Part 2: Graphing Sine and Cosine

To graph sine and cosine, we will be using a Cartesian plane that has angles for x values.

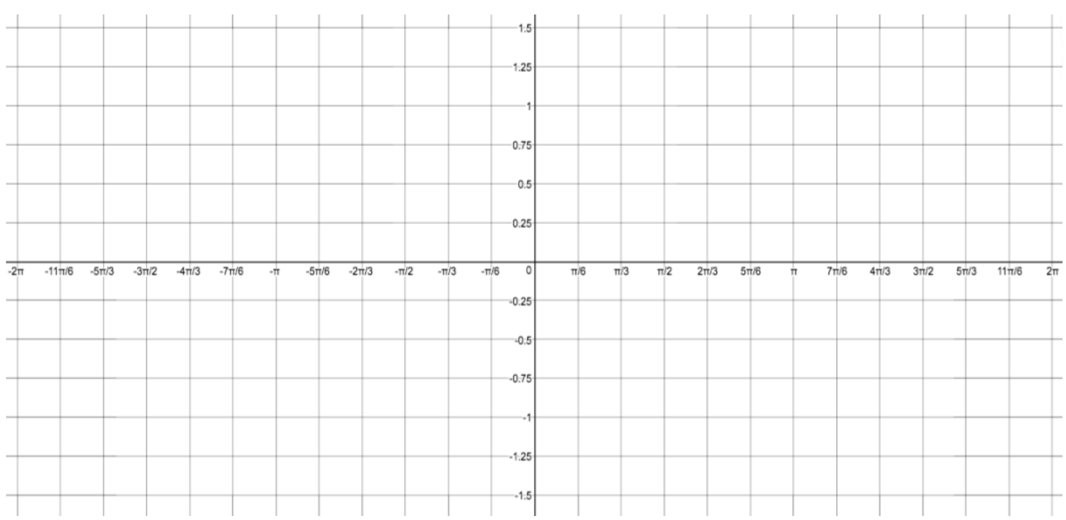
Example 1: Complete the following table of values for the function $f(x) = \sin(x)$. Use special triangles, the unit circle, or a calculator to find values for the function at $30° = \frac{\pi}{6}$ radian intervals.

x	$\sin x$
0	
$\frac{\pi}{6}$	
$\frac{2\pi}{6} = \frac{\pi}{3}$	
$\frac{3\pi}{6} = \frac{\pi}{2}$	
$\frac{4\pi}{6} = \frac{2\pi}{3}$	
$\frac{5\pi}{6}$	
$\frac{6\pi}{6} = \pi$	
$\frac{7\pi}{6}$	
$\frac{8\pi}{6} = \frac{4\pi}{3}$	
$\frac{9\pi}{6} = \frac{3\pi}{2}$	
$\frac{10\pi}{6} = \frac{5\pi}{3}$	
$\frac{11\pi}{6}$	
$\frac{12\pi}{6} = 2\pi$	



Example 2: Complete the following table of values for the function $f(x) = \cos(x)$. Use special triangles, the unit circle, or a calculator to find values for the function at $30° = \frac{\pi}{6}$ radian intervals.

x	$\cos x$
0	
$\frac{\pi}{6}$	
$\frac{2\pi}{6} = \frac{\pi}{3}$	
$\frac{3\pi}{6} = \frac{\pi}{2}$	
$\frac{4\pi}{6} = \frac{2\pi}{3}$	
$\frac{5\pi}{6}$	
$\frac{6\pi}{6} = \pi$	
$\frac{7\pi}{6}$	
$\frac{8\pi}{6} = \frac{4\pi}{3}$	
$\frac{9\pi}{6} = \frac{3\pi}{2}$	
$\frac{10\pi}{6} = \frac{5\pi}{3}$	
$\frac{11\pi}{6}$	
$\frac{12\pi}{6} = 2\pi$	



Properties of both Sine and Cosine Functions

Domain:

Range:

Period:

Amplitude:

_____________: *the horizontal length of one cycle on a graph.*

_____________: *half the distance between the maximum and minimum values of a periodic function.*

Part 3: Graphing the Tangent Function

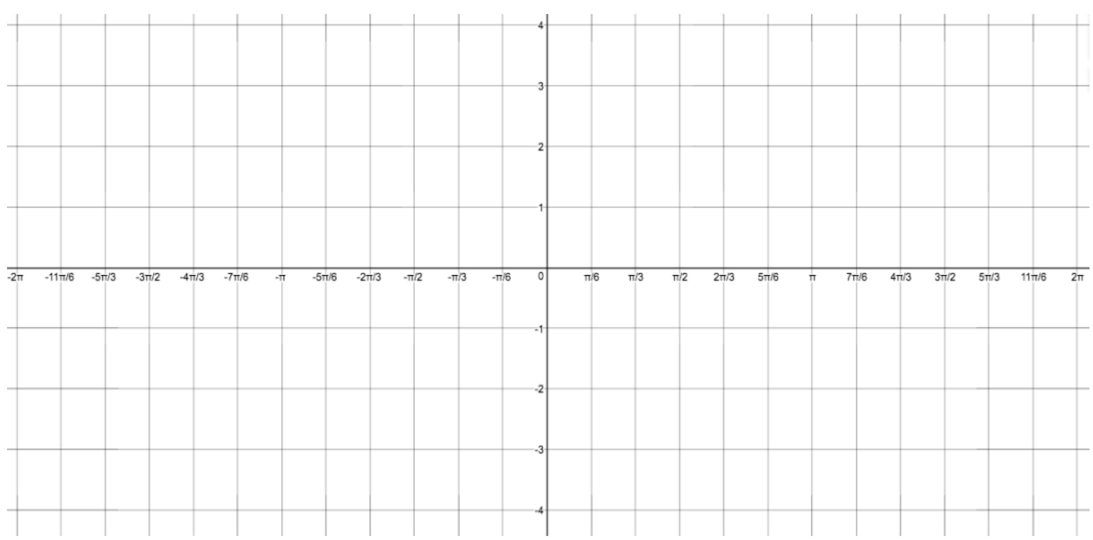
Recall: $\tan\theta = \frac{\sin\theta}{\cos\theta}$

Note: Since $\cos\theta$ is in the denominator, any time $\cos\theta = 0$, $\tan\theta$ will be undefined which will lead to a vertical asymptote.

Since $\sin\theta$ is in the numerator, any time $\sin\theta = 0$, $\tan\theta$ will equal 0 which will be an x-intercept.

Example 3: Complete the following table of values for the function $f(x) = \tan(x)$. Use the quotient identity to find y-values.

x	$\tan x$
0	
$\frac{\pi}{6}$	
$\frac{2\pi}{6} = \frac{\pi}{3}$	
$\frac{3\pi}{6} = \frac{\pi}{2}$	
$\frac{4\pi}{6} = \frac{2\pi}{3}$	
$\frac{5\pi}{6}$	
$\frac{6\pi}{6} = \pi$	
$\frac{7\pi}{6}$	
$\frac{8\pi}{6} = \frac{4\pi}{3}$	
$\frac{9\pi}{6} = \frac{3\pi}{2}$	
$\frac{10\pi}{6} = \frac{5\pi}{3}$	
$\frac{11\pi}{6}$	
$\frac{12\pi}{6} = 2\pi$	



Properties of the Tangent Function

Domain:

Range:

Period:

Amplitude:

Part 4: Graphing Reciprocal Trig Functions

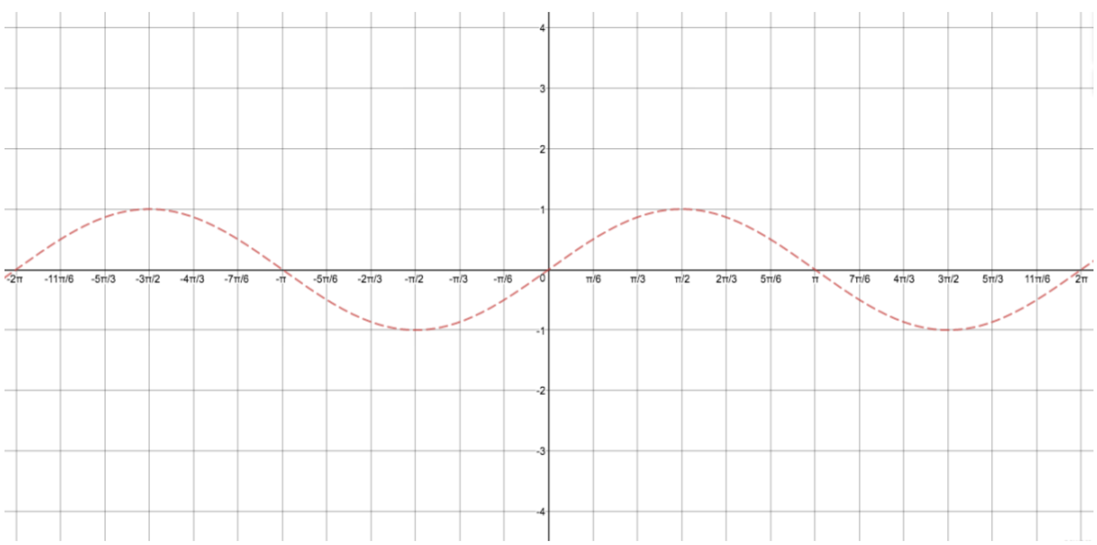
Reciprocal Identities		
$\boldsymbol{csc\ \theta =}$	$\boldsymbol{sec\ \theta =}$	$\boldsymbol{cot\ \theta =}$

The graph of a reciprocal trig function is related to the graph of its corresponding primary trig function in the following ways:

- Reciprocal has a vertical asymptote at each zero of its primary trig function
- Has the same positive/negative intervals but intervals of increasing/decreasing are reversed
- y-values of 1 and -1 do not change and therefore this is where the reciprocal and primary intersect
- Local min points of the primary become local max of the reciprocal and vice versa.

Example 4: Complete the following table of values for the function $f(x) = \csc(x)$. Use the reciprocal identity to find y-values.

x	$\csc x$
0	
$\frac{\pi}{6}$	
$\frac{2\pi}{6} = \frac{\pi}{3}$	
$\frac{3\pi}{6} = \frac{\pi}{2}$	
$\frac{4\pi}{6} = \frac{2\pi}{3}$	
$\frac{5\pi}{6}$	
$\frac{6\pi}{6} = \pi$	
$\frac{7\pi}{6}$	
$\frac{8\pi}{6} = \frac{4\pi}{3}$	
$\frac{9\pi}{6} = \frac{3\pi}{2}$	
$\frac{10\pi}{6} = \frac{5\pi}{3}$	
$\frac{11\pi}{6}$	
$\frac{12\pi}{6} = 2\pi$	



Properties of the Cosecant Function

Domain:

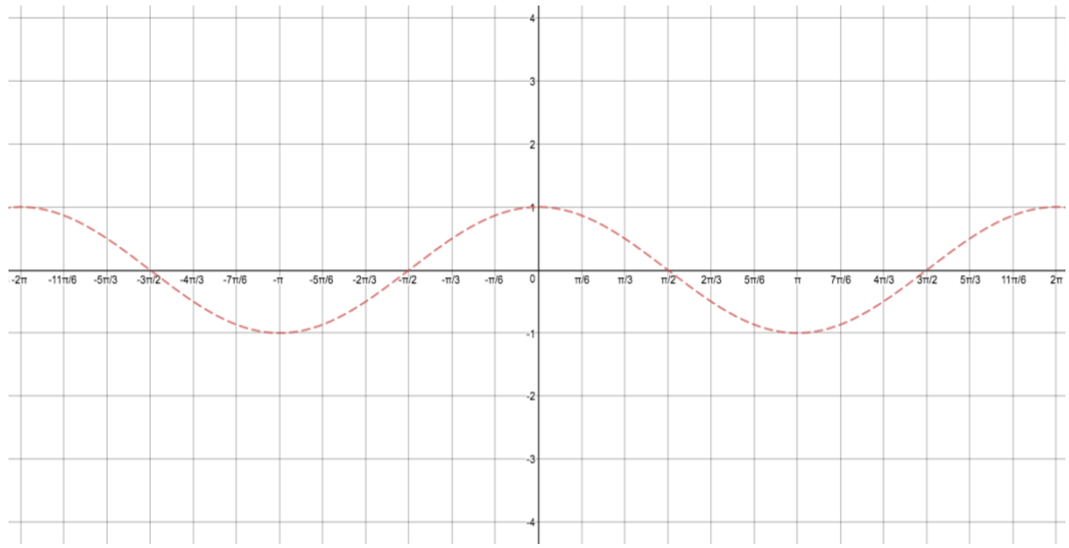
Range:

Period:

Amplitude:

Example 5: Complete the following table of values for the function $f(x) = sec\,(x)$. Use the reciprocal identity to find y-values.

x	$\sec x$
0	
$\frac{\pi}{6}$	
$\frac{2\pi}{6} = \frac{\pi}{3}$	
$\frac{3\pi}{6} = \frac{\pi}{2}$	
$\frac{4\pi}{6} = \frac{2\pi}{3}$	
$\frac{5\pi}{6}$	
$\frac{6\pi}{6} = \pi$	
$\frac{7\pi}{6}$	
$\frac{8\pi}{6} = \frac{4\pi}{3}$	
$\frac{9\pi}{6} = \frac{3\pi}{2}$	
$\frac{10\pi}{6} = \frac{5\pi}{3}$	
$\frac{11\pi}{6}$	
$\frac{12\pi}{6} = 2\pi$	



Properties of the Secant Function

Domain:

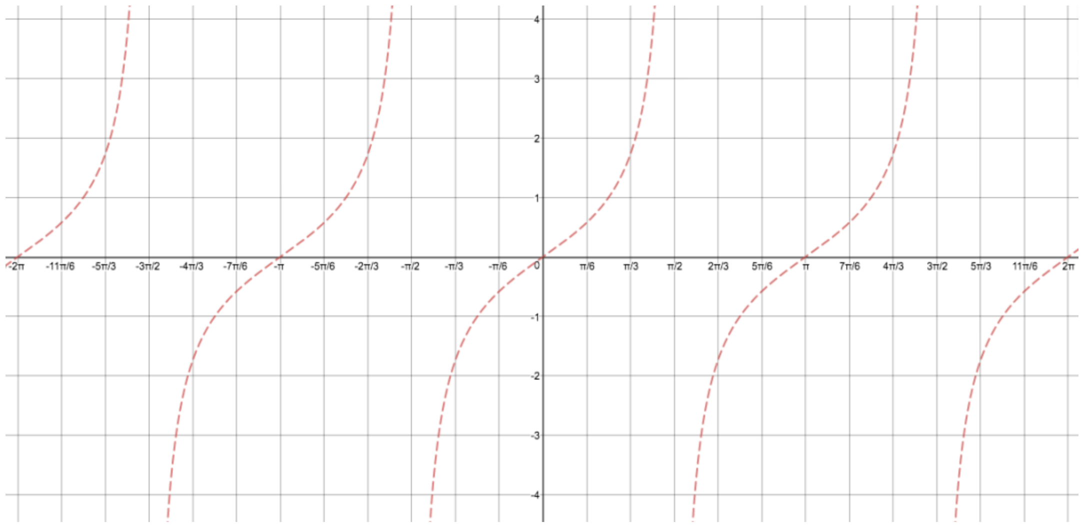
Range:

Period:

Amplitude:

Example 6: Complete the following table of values for the function $f(x) = \cot(x)$. Use the reciprocal identity to find y-values.

x	$\cot x$
0	
$\frac{\pi}{6}$	
$\frac{2\pi}{6} = \frac{\pi}{3}$	
$\frac{3\pi}{6} = \frac{\pi}{2}$	
$\frac{4\pi}{6} = \frac{2\pi}{3}$	
$\frac{5\pi}{6} = \frac{2\pi}{3}$	
$\frac{6\pi}{6} = \pi$	
$\frac{7\pi}{6}$	
$\frac{8\pi}{6} = \frac{4\pi}{3}$	
$\frac{9\pi}{6} = \frac{3\pi}{2}$	
$\frac{10\pi}{6} = \frac{5\pi}{3}$	
$\frac{11\pi}{6}$	
$\frac{12\pi}{6} = 2\pi$	



Properties of the Cotangent Function

Domain:

Range:

Period:

Amplitude: