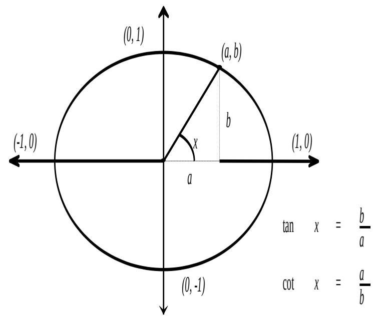
SM 3H

Date: 3/11/24 **Section:** 7.6

Objective: I can graph tan and cot.

Let (a,b) be coordinates of points on the unit circle. For any given angle x, $\tan x = b/a$. This means that $y=\tan x$ is undefined whenever $a=0$. For any given angle x, $\cot x = a/b$. This means that $y=\cot x$ is undefined whenever $b=0$. Notice that it takes π radians for the values of the tangent and cotangent to make one complete cycle.



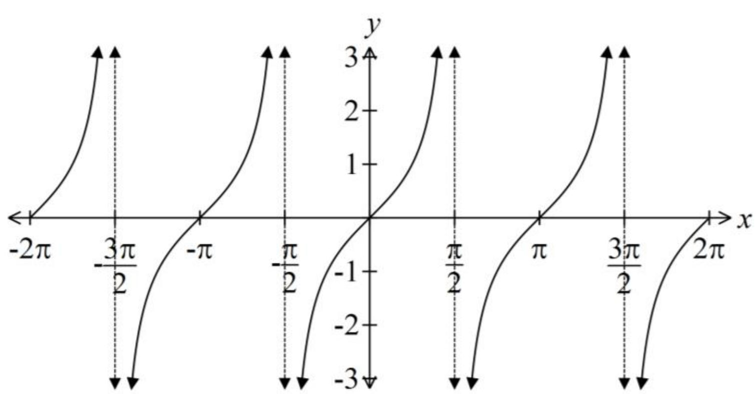
See notecard

Graphing Tangent Functions:

The domain of $y=\tan x$ is the set of all real numbers except numbers of the form____________ where k is an integer. The equations of the vertical asymptotes are __________________ where k is an integer.

Key points on the graph of $y=\tan x$:

x					
$y=\tan x$					



To graph $y=a\tan[b(x-c)]+d$:

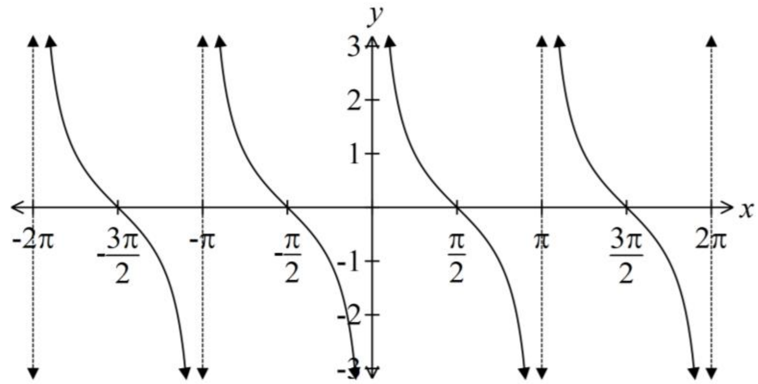
1. Start with the three key points on the graph of $y=\tan x$ and the equations of the asymptotes.
2. Find three key points and the asymptotes for $y=a\tan[b(x-c)]+d$ by:
   a. dividing each x-coordinate by b and adding c. (Treat the equations of the asymptotes like x-coordinates.)
   b. multiplying each y-coordinate by a and adding d.
3. Sketch one cycle of $y=a\tan[b(x-c)]+d$ through the three new points and approaching the new asymptotes.

★ **The period of $y=a\tan[b(x-c)]+d$ and $y=a\cot[b(x-c)]+d$ is ________ rather than $2\pi/b$.**

Graphing Cotangent Functions:
The domain of $y = \cot x$ is the set of all real numbers except numbers of the form ________ where k is an integer. The equations of the vertical asymptotes are __________ where k is an integer.

Key points on the graph of $y = \cot x$:

x					
$y = \cot x$					

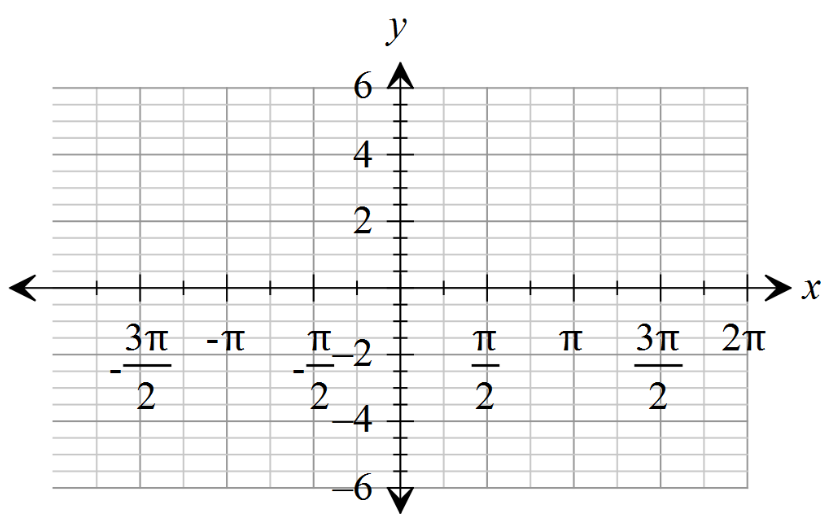


To graph $y = a\cot\left[b\left(x - c\right)\right] + d$:

1. Start with the three key points on the graph of $y = \cot x$ and the equations of the asymptotes.
2. Find three key points and the asymptotes for $y = a\cot\left[b\left(x - c\right)\right] + d$ by:
   a. dividing each x-coordinate by b and adding c. (Treat the equations of the asymptotes like x-coordinates.)
   b. multiplying each y-coordinate by a and adding d.
3. Sketch one cycle of $y = a\cot\left[b\left(x - c\right)\right] + d$ through the three new points and approaching the new asymptotes.

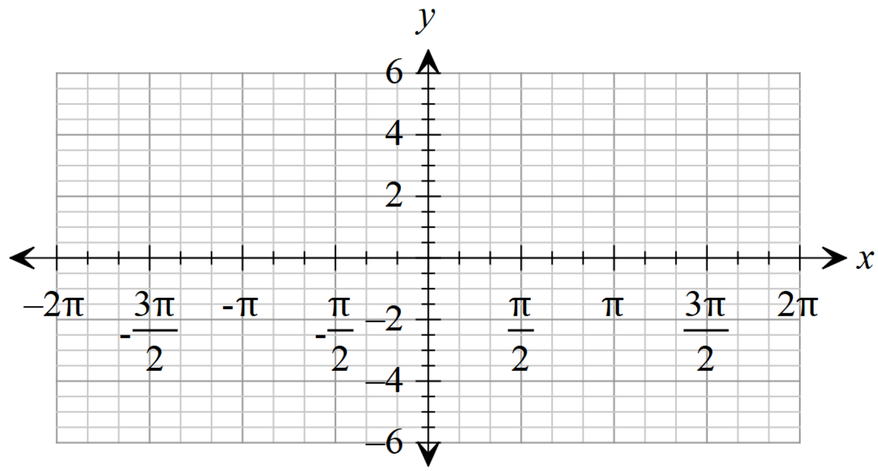
Examples: Graph the following functions. Find the period and the equations of the asymptotes of each.
$f(x) = \tan\left(\frac{1}{2}x\right)$

x	f



$f(x) = 2\cot\left(x + \frac{\pi}{3}\right)$

x	$f(x)$



$f(x) = 3\tan\left(2x + \frac{\pi}{2}\right) + 1$

$3\tan(2(x+\frac{\pi}{4}))+1$

$\frac{x}{2}-\frac{\pi}{4}$ $3y+1$

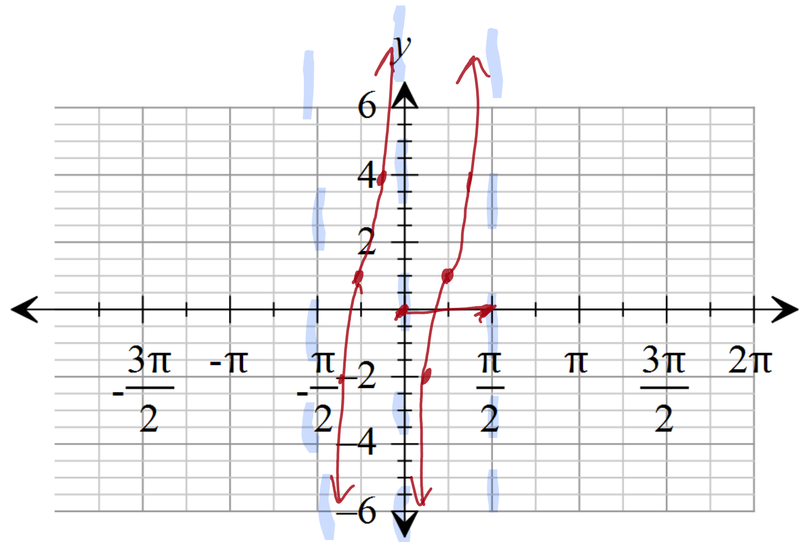
	x	$f(x)$	
0	$-\frac{\pi}{4}$	1	0
$\frac{\pi}{4}$	$-\frac{\pi}{8}$	4	1
$\frac{\pi}{2}$	0	undef	undef
$\frac{3\pi}{4}$	$\frac{\pi}{8}$	-2	-1
π	$\frac{\pi}{4}$	1	0

$a = 3$
$b = 2$
$\text{per} = \frac{\pi}{2}$
$c = -\frac{\pi}{4}$
$d = 1$

Period

asy: $x = \frac{\pi}{2}k$

Range: $(-\infty, \infty)$



$f(x) = 2\cot\left[3\left(x - \frac{\pi}{6}\right)\right] - 1$

x	$f(x)$