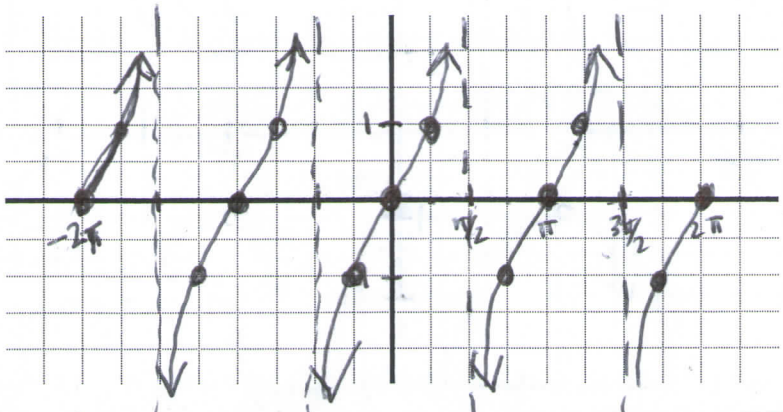
Graph each trigonometric function.

1) $y = \tan x$

	x	y
(1,0)	0	0
	$\pi/4$	1
(0,1)	$\pi/2$	undef.
	$3\pi/4$	−1
(−1,0)	π	0
	$5\pi/4$	1
(0,−1)	$3\pi/2$	undef.
	$7\pi/4$	−1
	2π	0

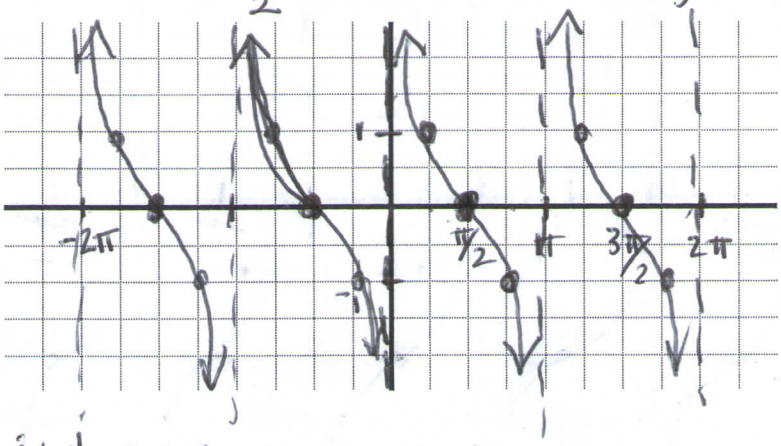


period = π

asymptotes at $x = n \cdot \frac{\pi}{2}$ n is an odd integer

2) $y = \cot x$

x	y
0	undef
$\pi/2$	0
π	undef
$3\pi/2$	0
2π	undef



period = π

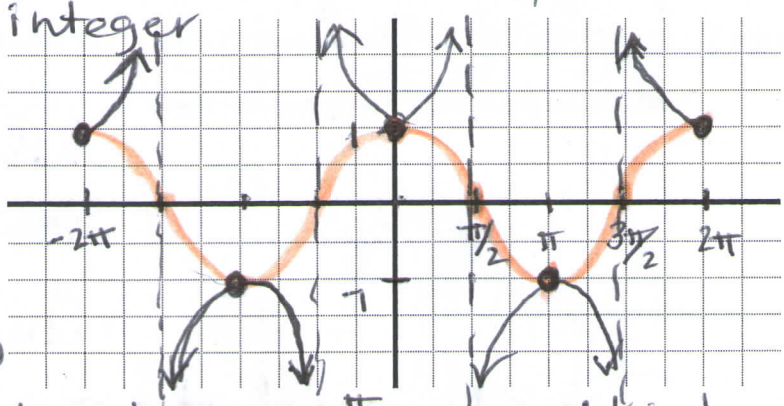
asymptotes at $x = n \cdot \pi$

n is an integer

3) $y = \sec x$

reciprocal of cosine

$\sec\theta = \frac{\text{hypt}}{\text{adj}} = \frac{1}{x}$



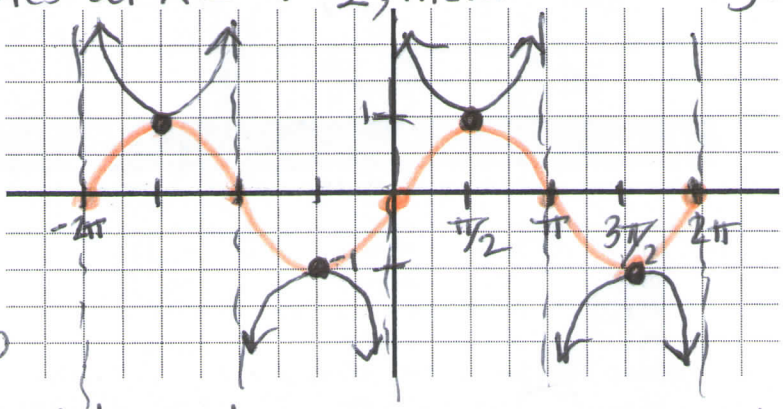
sec undefined where $x=0$

period = 2π asymptotes at $x = n \cdot \frac{\pi}{2}$, n is an odd integer

4) $y = \csc x$

reciprocal of sine

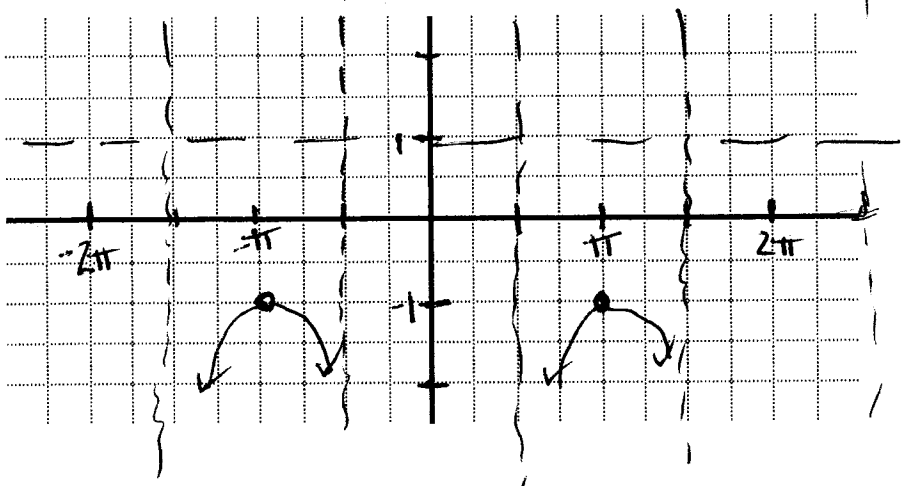
$\csc\theta = \frac{\text{hypt}}{\text{opp}} = \frac{1}{y}$



csc undefined where $y=0$

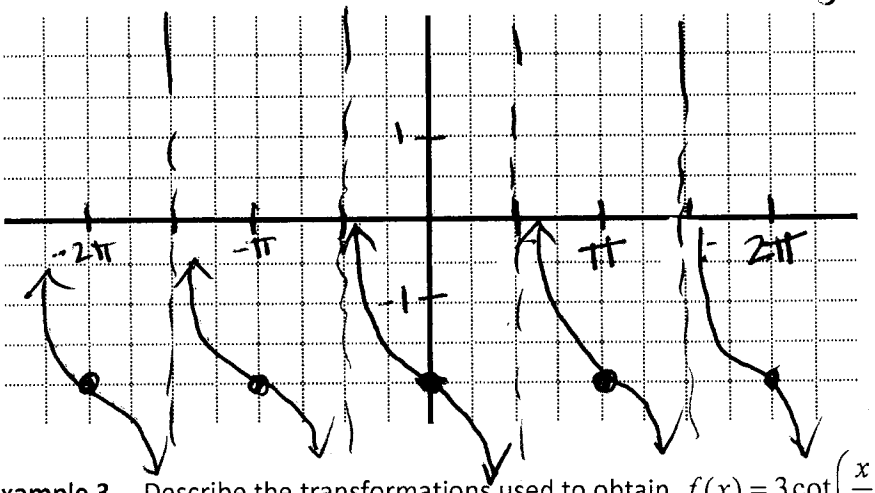
period = 2π asymptotes at $x = n \cdot \pi$, n is an integer

Example 1 Graph $y = 2\sec x + 1$ vert. stretch * 2, shift up 1



* y's by 2
add 1 to y's

Example 2 Graph $y = \tan(-x) - 2$ reflect over y-axis, shift down 2



Example 3 Describe the transformations used to obtain $f(x) = 3\cot\left(\frac{x}{2}\right) + 1$ from its parent function.

Where are the vertical asymptotes located?

horiz. stretch * 2
vert. stretch * 3
Shift up 1

$y = \cot x$ asympt. at $n \cdot \pi$

asymptotes at $x = n \cdot 2\pi$. n is an integer

Summary: Basic Trigonometric Functions

Function	Period	Domain	Range	Asymptotes	Zeros	Even/ Odd
$\sin x$	2π	All reals	$[-1, 1]$	None	$n\pi$	Odd
$\cos x$	2π	All reals	$[-1, 1]$	None	$\pi/2 + n\pi$	Even
$\tan x$	π	$x \neq \pi/2 + n\pi$	All reals	$x = \pi/2 + n\pi$	$n\pi$	Odd
$\cot x$	π	$x \neq n\pi$	All reals	$x = n\pi$	$\pi/2 + n\pi$	Odd
$\sec x$	2π	$x \neq \pi/2 + n\pi$	$(-\infty, -1] \cup [1, \infty)$	$x = \pi/2 + n\pi$	None	Even
$\csc x$	2π	$x \neq n\pi$	$(-\infty, -1] \cup [1, \infty)$	$x = n\pi$	None	Odd