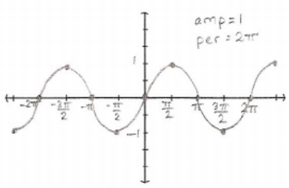
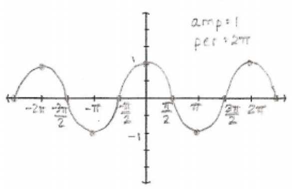
Graphing Trigonometric Functions continued...

$y = \sin x$

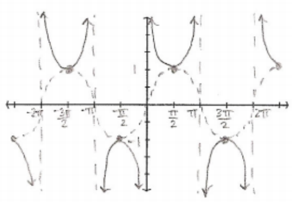


$y = \cos x$



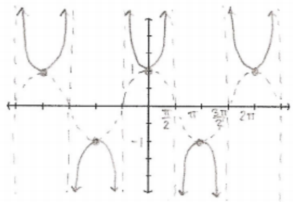
$y = \csc x = \frac{1}{\sin x}$

no zeros; asymptotes when $\sin x = 0$



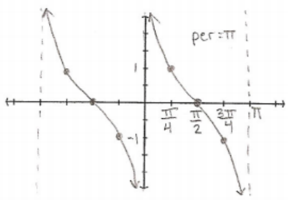
$y = \sec x = \frac{1}{\cos x}$

no zeros; asymptotes when $\cos x = 0$



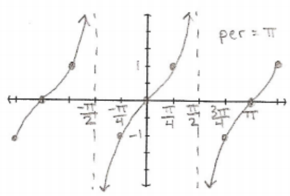
$y = \cot x = \frac{\cos x}{\sin x}$

zeros when $\cos x = 0$; asymptotes when $\sin x = 0$



$y = \tan x = \frac{\sin x}{\cos x}$

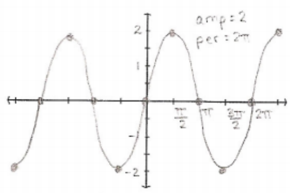
zeros when $\sin x = 0$; asymptotes when $\cos x = 0$



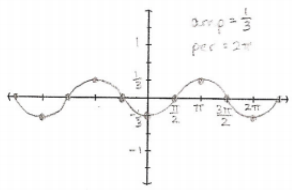
$y = af(x)$

For $y = \sin x$ and $y = \cos x$, $|a|$ is the amplitude of the function. If $a < 0$, flip the graph vertically.

Ex. $y = 2\sin x$

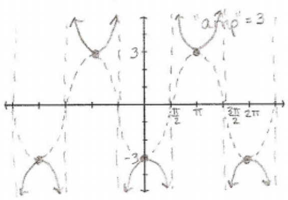


$y = -\frac{1}{3}\cos x$

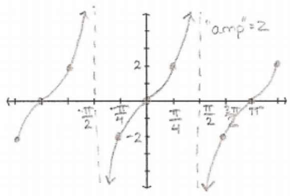


For $y = \sec x$, $y = \csc x$, $y = \tan x$, and $y = \cot x$, $|a|$ is the "amplitude" of reference points of the function. For $\sec x$ and $\csc x$, these are the maximum and minimum points, and for $\tan x$ and $\cot x$, these are the points halfway in between the zeros and vertical asymptotes.

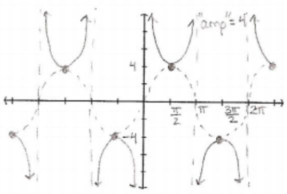
Ex. $y = -3\sec x$



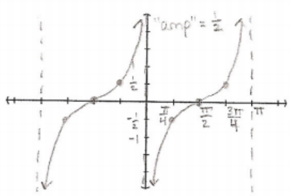
$y = 2\tan x$



Ex. $y = 4\csc x$



$y = -\frac{1}{2}\cot x$



$y = f(bx)$

amp: $|a|$ in $y = af(x)$

The period of $y = \sin x$, $y = \cos x$, $y = \sec x$, and $y = \csc x$ is 2π. The period of $y = \tan x$ and $y = \cot x$ is π. This is how often the graph repeats itself. When x is multiplied by a constant, the period changes.

$$new\ period = \frac{period\ of\ original\ function\ (\pi\ or\ 2\pi)}{|b|}$$

$y = \sin \frac{1}{2}x$

per: $\frac{2\pi}{1/2} = 4\pi$

$y = \tan \frac{\pi}{8}x$

per: $\frac{\pi}{\pi/8} = \cancel{\pi} \cdot \frac{8}{\cancel{\pi}} = 8$

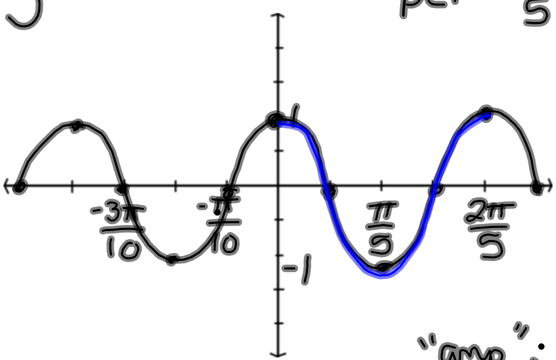
$y = \sec \frac{259}{\pi^2} x$

per: $\frac{2\pi}{\frac{259}{\pi^2}} = \frac{2\pi}{1} \cdot \frac{\pi^2}{259} = \frac{2\pi^3}{259}$

$y = \cos 5x$

amp: 1

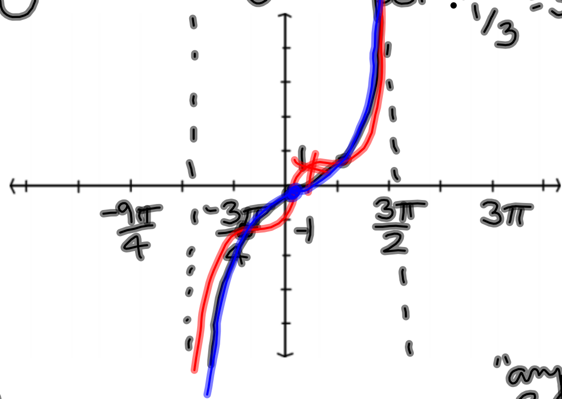
per: $\frac{2\pi}{5}$



$y = \tan \frac{1}{3}x$

"amp": 1

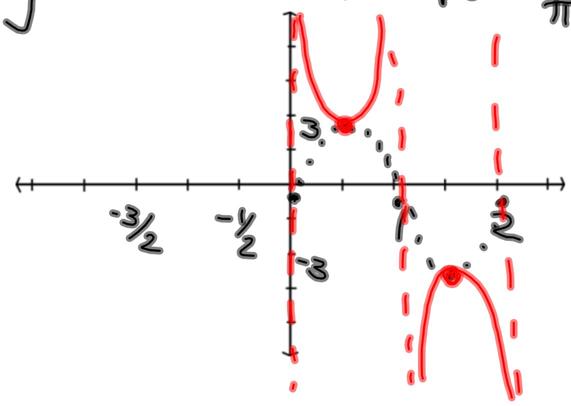
per: $\frac{\pi}{1/3} = 3\pi$



$y = 3\csc \pi x$

"amp": 3

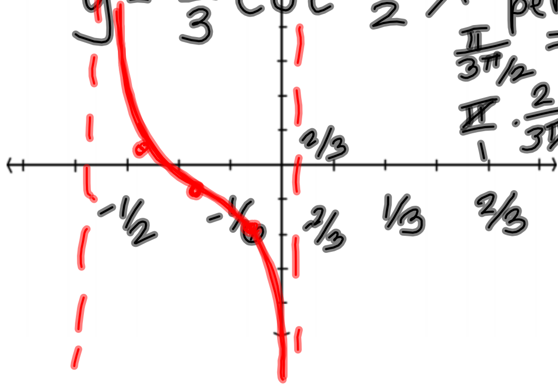
per: $\frac{2\pi}{\pi} = 2$



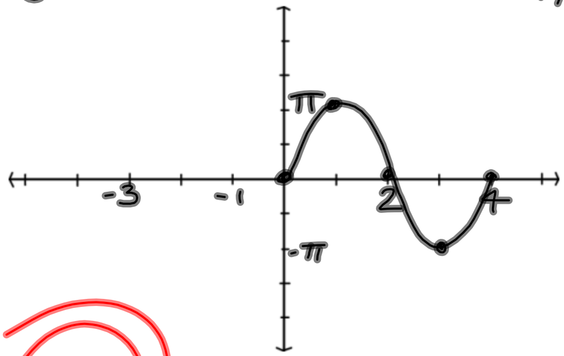
$y = \frac{2}{3}\cot \frac{3\pi}{2}x$

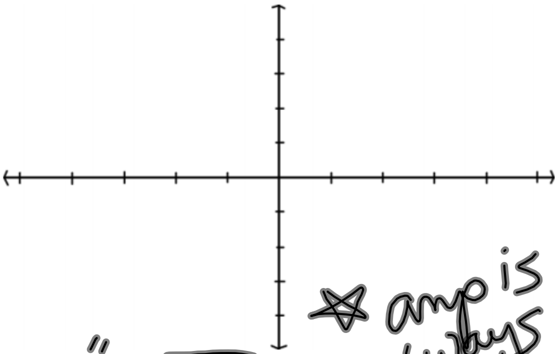
"amp": $2/3$

per: $\frac{\pi}{3\pi/2} = \frac{\cancel{\pi}}{1} \cdot \frac{2}{3\cancel{\pi}} =$



$y = \pi \sin \frac{\pi}{2} x$ amp: π per: $\frac{2\pi}{\pi/2} = 4$



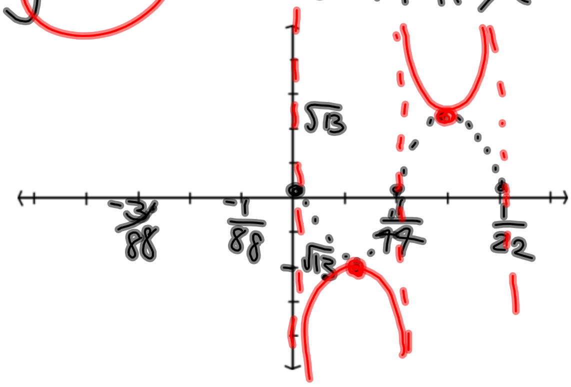


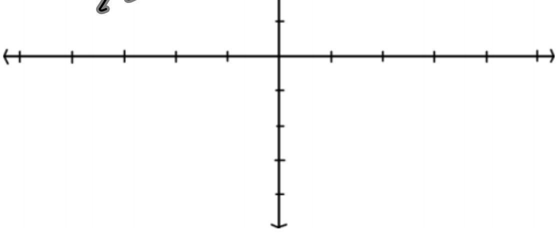
$y = -\sqrt{13} \csc 44\pi x$

"amp": $\sqrt{13}$

per: $\frac{\cancel{2\pi}}{\cancel{44\pi}_{22}} = \frac{1}{22}$

★ amp is always positive





$y = a f(bx)$

mult ⇒ stretching

$y = f(x+c)+d$

add ⇒ shifting

d = vertical shift

if $d>0$ up

$d<0$ down

c = horizontal shift

$c>0$ left

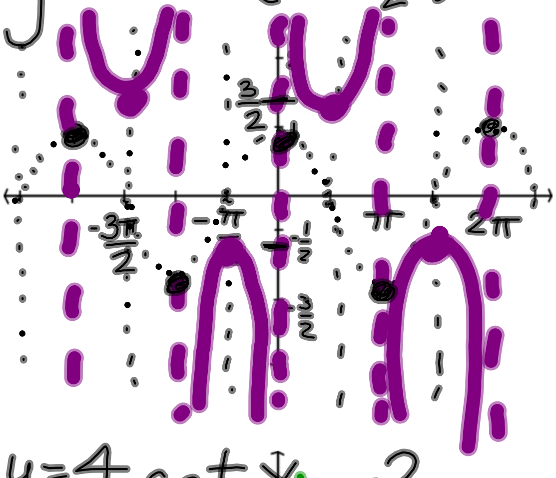
$c<0$ right

coeff's outside ⇒ vertical as you would expect;

inside ⇒ horizontal, opposite of what you would expect

$y = x^2$ v. $y = (x+1)^2$

$y = \sec\left(x - \frac{\pi}{2}\right) + \frac{1}{2}$



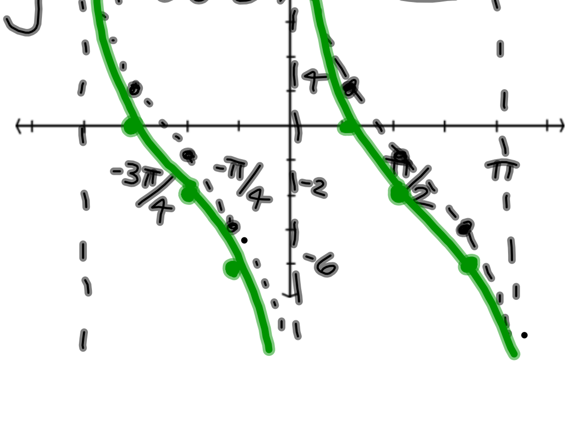
"amp": 1

per: 2π

horizontal shift: right $\pi/2$

vertical shift: up $1/2$

$y = 4\cot x - 2$



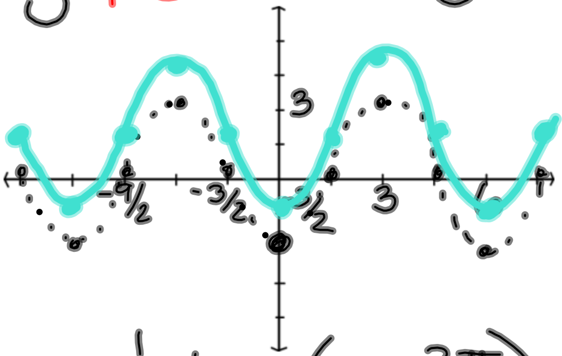
"amp": 4

per: π

h. shift: none

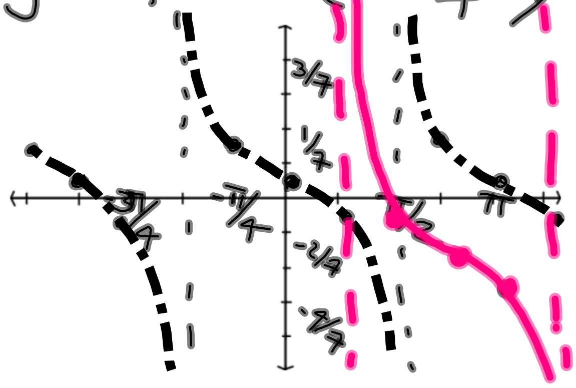
v. shift: down 2

$y = -3\cos\frac{\pi}{3}x + \frac{3}{2}$



amp:	3
per: $\frac{2\pi}{\pi/3} = 2\pi\cdot\frac{3}{\pi} = 6$	
h.shift:	none
v.shift:	up $3/2$

$y = -\frac{1}{7}\tan\left(x - \frac{3\pi}{4}\right) - \frac{2}{7}$



"amp:"	$1/7$
per:	π
h.shift:	right $3\pi/4$
v.shift:	down $2/7$

HW: #19–52

(at a minimum, do through #36 for tomorrow)