Assignments for the week of Sept. 6:

- 45 minutes of Khan Academy
- Read 5.5-5.7 and "Trig Guide to Graphing" on brewermath.com
- Due Fri. 9 Sept:
  5.5: #55-60 all; 77-84 all
  5.6 #1-47 odd; 49-54 all; 63-70 all

- Not due until next week:
  5.7 #1-50 all; #53-64 all; 87-92 all

$y = f(x)$

Goal:

$y = a f(bx + c) + d$

$y = f(x) + g(x)$

$y = af(bx)$

multiplication always results in a stretch of the graph.

constants applied outside the function affect it vertically as we expect; inside - horizontally, opposite of what we would expect

$$\text{amplitude} = \frac{\text{max value} - \text{min value}}{2}$$

for $y = a\sin bx$

amplitude $= |a|$

If $a < 0$, vertical flip

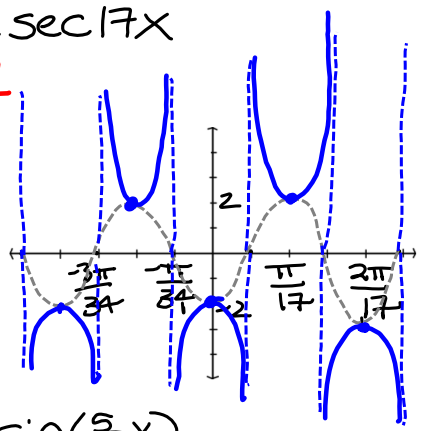
$$\text{period} = \frac{\text{original period } (2\pi \text{ or } \pi)}{|b|}$$

If $b < 0$, horizontal flip

$y = -2\sec 17x$

amplitude: 2

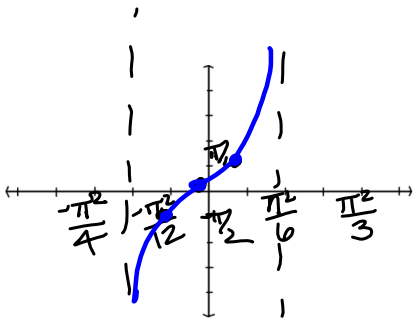
period: $\frac{2\pi}{17}$



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

amplitude: $\pi/2$

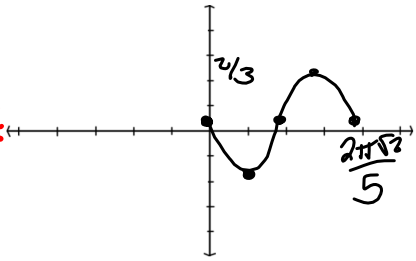
period: $\frac{\pi}{3/\pi} = \pi \cdot \frac{\pi}{3} = \pi^2/3$



$y = -\frac{2}{3}\sin\left(\frac{5}{\sqrt{2}}x\right)$

amplitude: 2/3

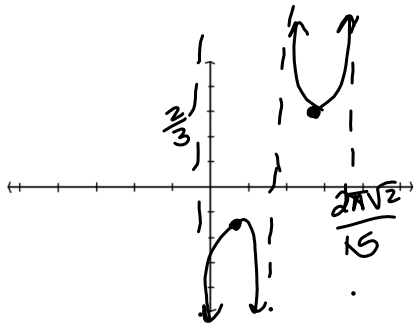
period: $\frac{2\pi}{5/\sqrt{2}} = \frac{2\pi\sqrt{2}}{5}$



$y = -\frac{2}{3}\csc\left(\frac{5}{\sqrt{2}}x\right)$

amplitude:

period:



Goal: Transform a trigonometric function of the form $y = f(x)$ to one of the form $y = af(bx + c) + d$ by observing changes in amplitude and period, as well as horizontal and vertical shifts.

Recall:

- Constants that are multiplied (divided) result in a stretching/scaling of the graph (amplitude/period changes), that we show by changing the scale on our axes
- Constants that are added (subtracted) result in shifting of the graph
- Constants outside the function (a & d) affect it vertically, as we would expect
- Constants inside the function (b & c) affect it horizontally, opposite of what we would expect

$y = af(bx)$ ✓ scaling

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

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

outside - vertically as we would expect

inside - horizontally, opposite

d = vertical shift ↕
- $d > 0$ up
- $d < 0$ down

c = horizontal shift ↔
- $c > 0$ left
- $c < 0$ right

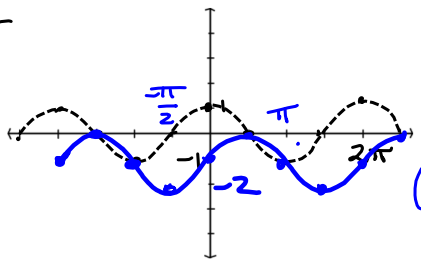
$y = \cos(x - \frac{\pi}{2}) - 1$

amplitude: 1

period: 2π

horiz. shift: right $\pi/2$

vert. shift: down 1

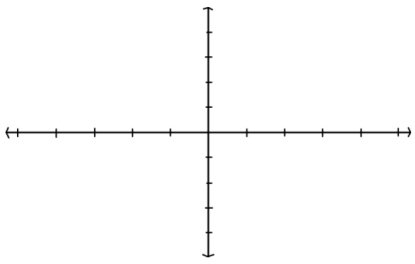


amplitude:

period:

horiz. shift:

vert. shift:



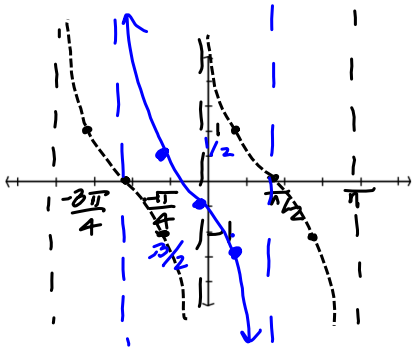
$y = \cot(x + \frac{\pi}{2}) - \frac{1}{2}$

amplitude: 1

period: π

horiz. shift: left $\pi/2$ (2 ticks)

vert. shift: down $1/2$ (1 tick)

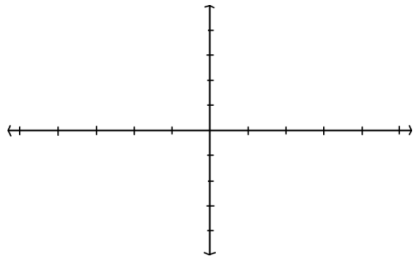


amplitude:

period:

horiz. shift:

vert. shift:



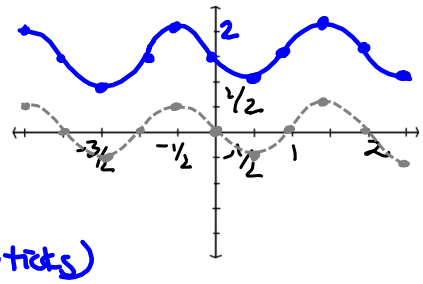
$y = -\frac{1}{2}\sin \pi x + \frac{3}{2}$

amplitude: $\frac{1}{2}$

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

horiz. shift: none

vert. shift: up $\frac{3}{2}$ (3 ticks)



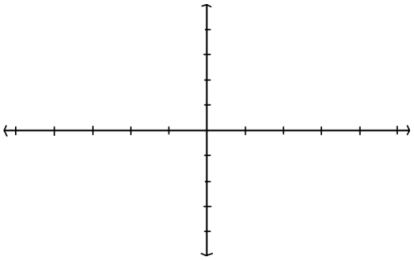
$y = 2\sec\left(\frac{\pi}{2}x - \pi\right)$

amplitude:

period:

horiz. shift:

vert. shift:



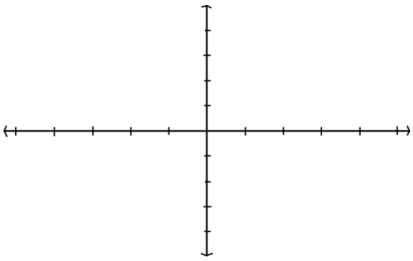
$y = -\frac{1}{3}\tan\left(\frac{1}{4}x + \frac{\pi}{4}\right) - \frac{1}{3}$

amplitude:

period:

horiz. shift:

vert. shift:



$y = -2\cos\left(\frac{\pi}{3}x - \frac{3\pi}{2}\right) + 1$

amplitude:

period:

horiz. shift:

vert. shift: