Review:

An industrial pulley has a 60 inch diameter, and moves a belt at a rate of 60 miles per hour. What is the angular speed of a point on the edge of the pulley?

in rev/min

$r = 30$ in
$v = 60$ mi/h
$\omega = ?$ rev/min

$\frac{v}{r} = \frac{r\omega}{r}$
$\omega = v \cdot \frac{1}{r}$

$\omega = \frac{\cancel{60}\,\cancel{mi}}{\cancel{h}} \cdot \frac{1}{\cancel{30}\,\cancel{in}} \cdot \frac{\cancel{12}\,\cancel{in}}{1\,\cancel{ft}} \cdot \frac{5280\,\cancel{ft}}{1\,\cancel{mi}} \cdot \frac{1\,h}{\underset{5}{\cancel{60}}\,min} \cdot \frac{1\,rev}{\cancel{2}\pi}$

$= \boxed{\frac{1056}{\pi}\ rev/min}$

Find the exact value of the following.

a. $\cos 270°$ $= \boxed{0}$

$(0,-1)$

b. $\sin -225°$ $= \boxed{\frac{1}{\sqrt{2}}}$

1, $\sqrt{2}$, 45, -1

c. $\csc 315°$ $= \boxed{-\sqrt{2}}$

1, 45, $\sqrt{2}$, -1

d. $\sec 420°$ $= \boxed{2}$

2, $60°$, $\sqrt{3}$, 1

e. $\tan -135°$ $= \boxed{1}$

1, -1, 45, $\sqrt{2}$

Graphing Trigonometric Functions continued...

Goal: Transform a trigonometric function of the form $y = f(x)$ to one of the form $\boxed{y = af(bx + c) + d}$ 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

Note:

When both b and c are present (i.e. when b is anything other than 1), the horizontal shift is not just $c = \frac{c}{1}$, as it is affected by the presence of b. In this case (and in general), the horizontal shift is $\frac{c}{b}$, which we can more easily see by factoring b out in the general equation: $\boxed{y = af\left[b\left(x + \frac{c}{b}\right)\right] + d}$

Summary:

For a Trigonometric function of the form $y = af\left[b\left(x+\frac{c}{b}\right)\right]+d$,

Amplitude $= |a|$ (note that amplitude is always positive)

$$\text{Period} = \frac{\textit{original period of the function } (\pi \textit{ or } 2\pi)}{|b|}$$

Horizontal shift $= \frac{c}{b}$, *left if* $\frac{c}{b}>0$, *right if* $\frac{c}{b}<0$

"phase shift" $= \frac{-c}{b}$

Vertical shift $= d$, *up if* $d>0$, *down if* $d<0$

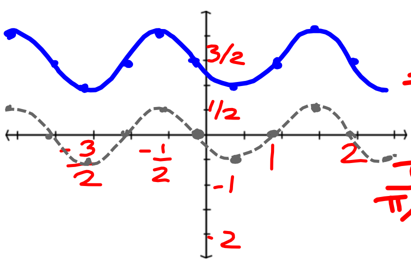
$y=-\frac{1}{2}\sin\pi x+\frac{3}{2}$

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

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

horiz. shift:
0 (none)

vert. shift:
$+\frac{3}{2}$
up $\frac{3}{2}$



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

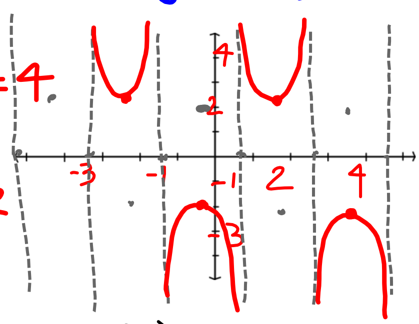
$y=-2\sec\frac{\pi}{2}x$

amplitude:
2

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

horiz. shift:
right $\frac{\pi}{\pi/2}=\frac{\pi}{1}\cdot\frac{2}{\pi}=2$

vert. shift:
0



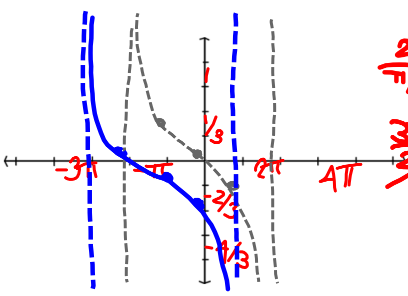
$y=-\frac{1}{3}\tan\left(\frac{1}{4}x+\frac{\pi}{4}\right)-\frac{1}{3}$

amplitude:
$\frac{1}{3}$

period:
$\frac{\pi}{1/4}=4\pi$

horiz. shift:
$\frac{\pi/4}{1/4}=\pi$ left

vert. shift:
down $\frac{1}{3}$



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

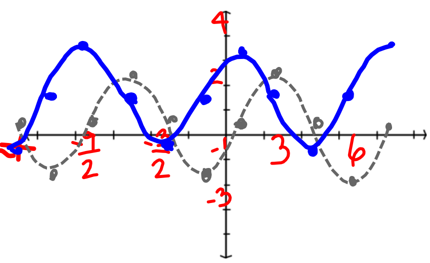
$y=2\sin\frac{\pi}{3}x+1$

amplitude:
2

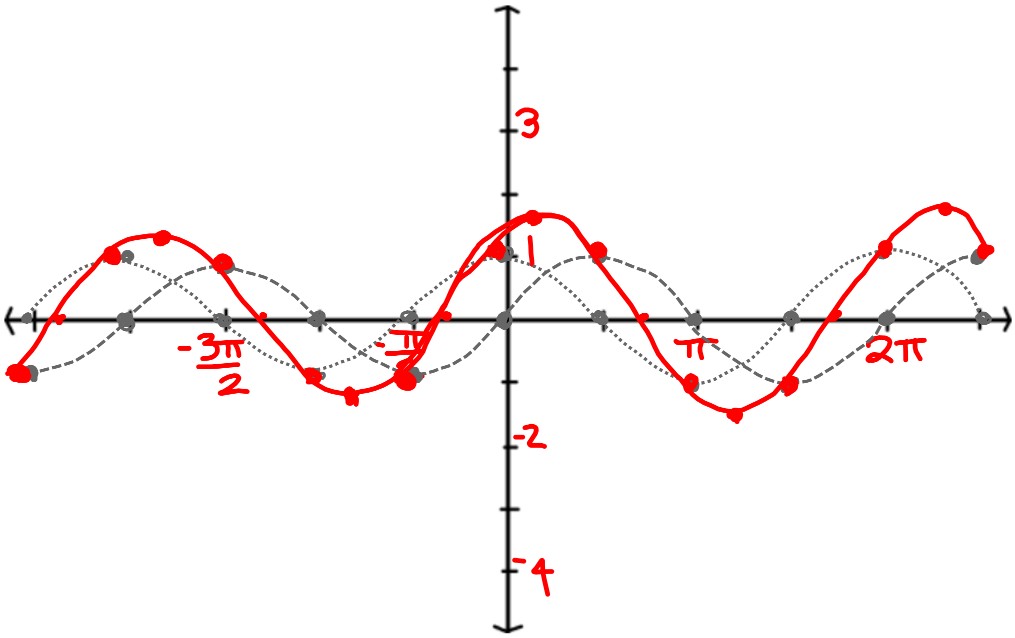
period:
$\frac{2\pi}{\pi/3}=6$

horiz. shift:
$\frac{3\pi/2}{\pi/3}=\frac{9}{2}$ right

vert. shift:
up 1



y = sin x + cos x



<u>Homework #4</u> (due Fri, 9/5)

- Graphing worksheets, problems #1-60
- <u>5.5</u> #55-60 all write an equation given a graph (sin & cos)
  #77-84 all write an equation given amplitude and period
- <u>5.6</u> #49-54 all write an equation given a graph (tan, cot, sec, csc)
  #63-70 all write an equation given ("amplitude" 1 and) period
- <u>5.7</u> #53-58 all graph sum functions
  #59-64 all write an equation given a graph
  #87-92 all write an equation given amplitude, period, & shifts