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? rev/min

$r = 30 \text{ in}$; $V = 60 \text{mi}/h$; $\omega = ?$

$\frac{V}{r} = \frac{\cancel{r}\omega}{\cancel{r}}$ $\omega = \frac{V}{1} \cdot \frac{1}{r}$

$\omega = \frac{\cancel{60}\cancel{mi}}{\cancel{h}} \cdot \frac{1}{\cancel{30}\cancel{in}} \cdot \frac{\overset{2}{\cancel{\overset{4}{\cancel{12}}}}\cancel{in}}{1 \cancel{ft}} \cdot \frac{528\cancel{0}\cancel{ft}}{1 \cancel{mi}} \cdot \frac{1 \text{rev}}{\cancel{2}\pi} \cdot \frac{1 \cancel{h}}{\cancel{60} \text{min}}$

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

Graphing Trigonometric Functions continued...

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

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: $\boxed{y = af\left[b\left(x + \frac{c}{b}\right)\right] + d}$

$y = af(bx+c)+d$

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)

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

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

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

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

amplitude:

$\frac{1}{2}$

period:

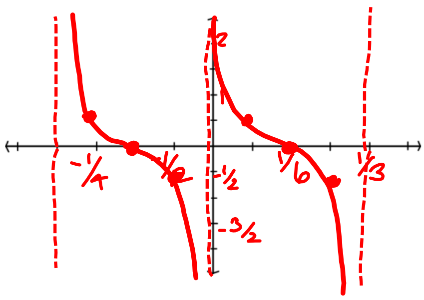
$\frac{\pi}{3\pi} = \frac{1}{3}$

horiz. shift:

none

vert. shift:

none



$y=-2\sec\frac{3\pi}{4}x$

amplitude:

2

period:

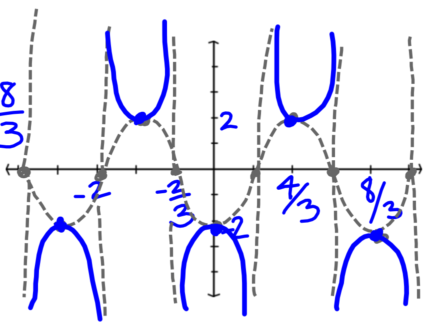
$\frac{2\pi}{\frac{3\pi}{4}} = \frac{2\pi}{1}\cdot\frac{4}{3\pi} = \frac{8}{3}$

horiz. shift:

none

vert. shift:

none



$y=\sin(x-\pi)+1$

amplitude:

1

period:

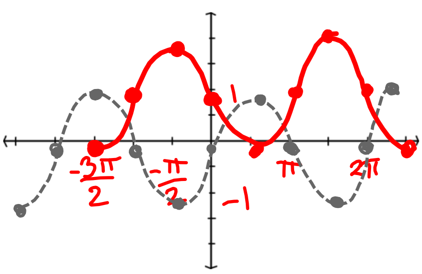
2π

horiz. shift:

right π

vert. shift:

up 1



$y=-2\tan(x)-4$

amplitude:

2

period:

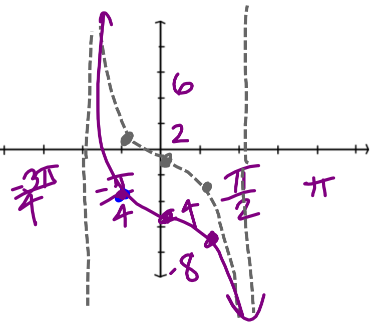
π

horiz. shift:

none

vert. shift:

down 4



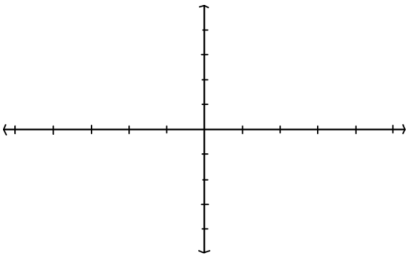
$y = -\frac{1}{2}\sin \pi x + \frac{3}{2}$

amplitude:

period:

horiz. shift:

vert. shift:



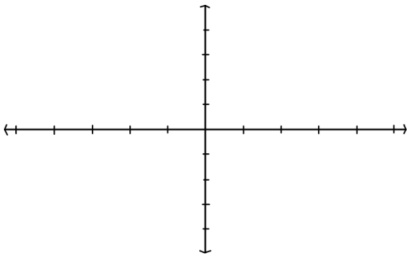
$y = 2\sec\left(\frac{\pi}{2}x - \pi\right)$

amplitude:

period:

horiz. shift:

vert. shift:



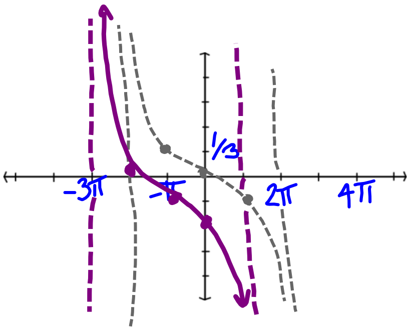
$y = -\frac{1}{3}\tan\left(\frac{1}{4}x + \frac{\pi}{4}\right) - \frac{1}{3}$

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

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

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

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



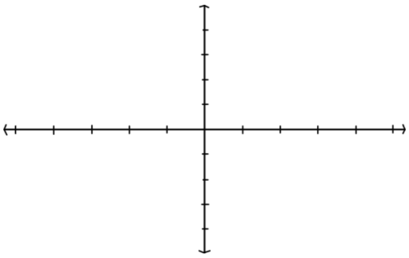
$y = -2\cos\left(\frac{\pi}{3}x - \frac{3\pi}{2}\right) + 1$

amplitude:

period:

horiz. shift:

vert. shift:



Homework #4 due Friday:
Graphing worksheet problems #1-48

Quiz - Thursday 12/05
Test #2 - Thurs 12/12?