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

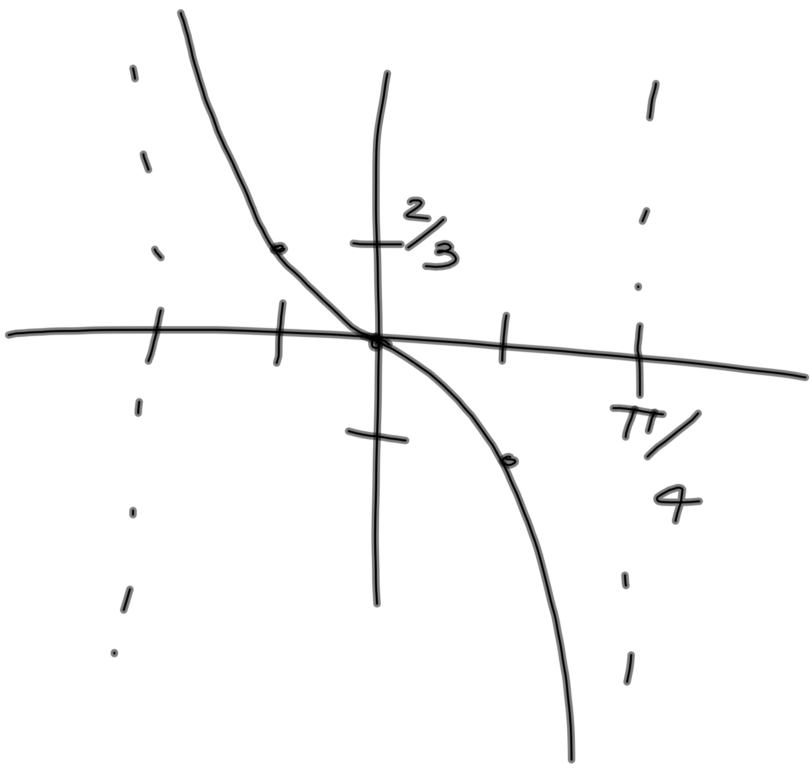
$r = 30$ in; $v = 60\ \text{mi}/h$; $\omega = ?\ \text{rev}/\text{min}$

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

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

$5 \overline{)5280}$ = 1056

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



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

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)

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

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

Vertical shift $= d$, $\begin{matrix} up\ if\ d>0 \\ down\ if\ d<0 \end{matrix}$

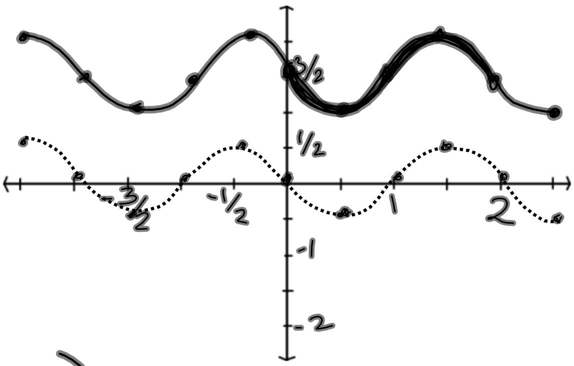
$y = -\frac{1}{2}\sin \pi x + \frac{3}{2}$

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

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

h.shift: none

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



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

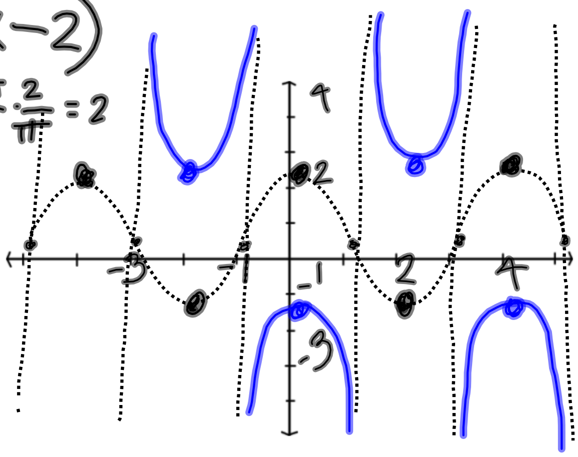
amp: 2

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

$\frac{\pi}{\pi/2} = \frac{\pi}{1} \cdot \frac{2}{\pi} = 2$

h.shift: right 2

v.shift: none



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

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

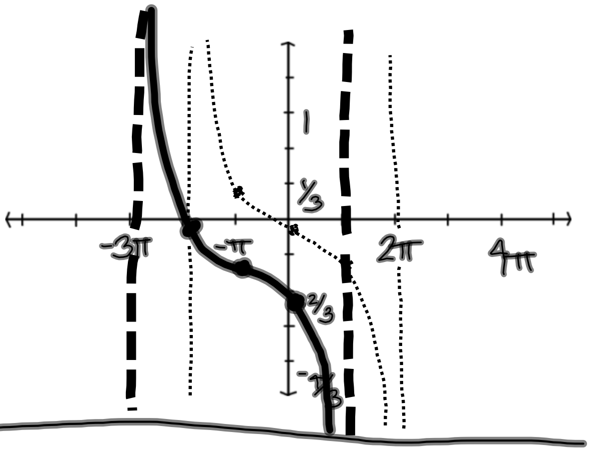
$\frac{\pi/4}{1/4} = \frac{\pi}{4} \cdot \frac{4}{1} = \pi$

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

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

h.shift: left π

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



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

amp: 2

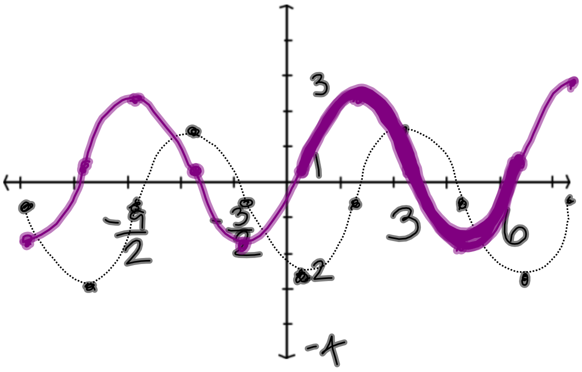
per: $\frac{2\pi}{\pi/3} = \frac{2\pi}{1} \cdot \frac{3}{\pi} = 6$

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

3 ticks

v.shift: up 1

1 tick



HW to turn in Friday

Graphs #1-48