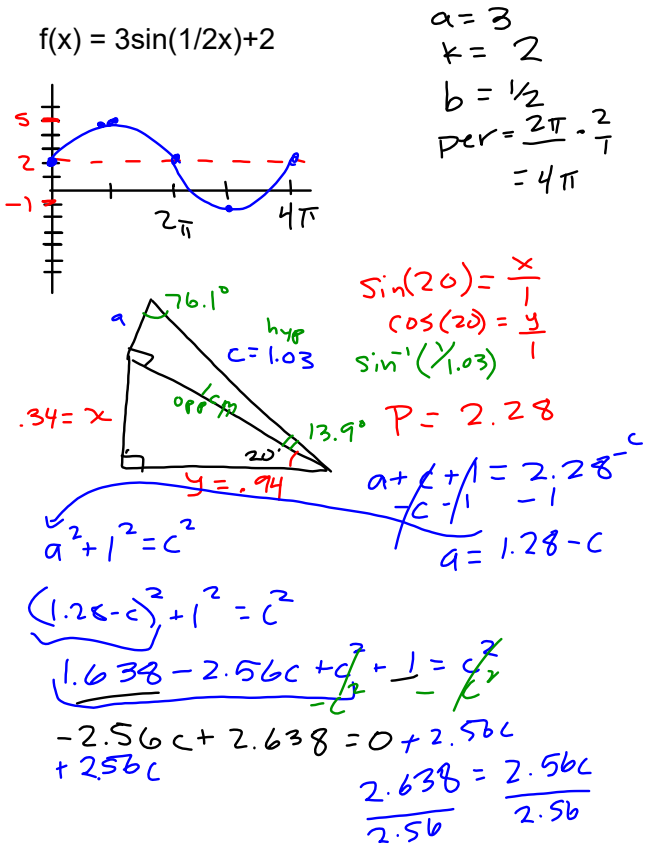
February 20, 2018

Bellwork: Find the amplitude and period of the trigonometric function and sketch a graph

f(x) = 3sin(1/2x)+2



Lesson 8.1 Objectives:

I can model real life situations using sine and cosine functions

The two general equations for sine and cosine are:

$$f(x) = a\sin(bx) + k \qquad \text{and} \qquad f(x) = a\cos(bx) + k$$

where: amplitude = |a|

$$\text{period} = \frac{2\pi}{|b|} \qquad b = \frac{2\pi}{\text{period}}$$

vertical shift/midline = k

$$\text{frequency} = \frac{1}{\text{period}} = \frac{b}{2\pi}$$

What are some real life situations that might be modeled using periodic functions?

Sound waves

light waves – E.M. waves infrared, UV, gamma, ect.

water

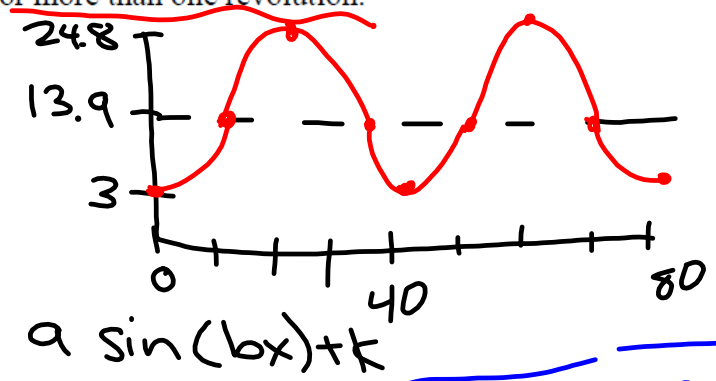
seismic waves

ferris wheel Merry go round

Example 1:

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

The Ferris wheel at Lagoon has a diameter of 21.8 meters. It rotates on a platform that is 3 meters above the ground. The Ferris wheel completes one revolution in 40 seconds. Write an equation to model the situation. Then sketch a graph of height versus time, extending the graph for more than one revolution.



$a = 10.9$
$k = 13.9$
$per: 40$ sec
$b = \frac{2\pi}{40} = \frac{\pi}{20}$

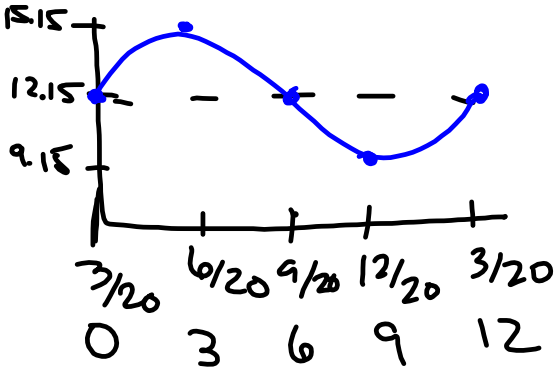
$a \sin(bx) + k$

21.6 ft

$h(x) = -10.9\cos\left(\frac{\pi}{20}x\right) + 13.9$

Example 2:

In Salt Lake City, Utah, at the spring equinox (March 20, 2013) there were 12 hours and 9 minutes of daylight. The longest day (June 20, 2013) and shortest day (December 21, 2013) of the year vary from the equinox by approximately 3 hours. Write a sine function that relates the number of days to the variation of daylight hours in Salt Lake City. Graph the model, showing at least one year.



$a = 3$
$b = \frac{2\pi}{12} = \frac{\pi}{6}$
$k = 12.15$ hrs
$per: 12$ mon

$3\sin\left(\frac{\pi}{6}x\right) + 12.15$