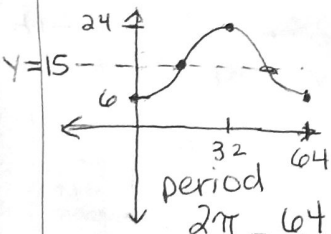
Construct a sinusoid y = f(x) that rises from a minimum value of y = 6 at x = 0 to a maximum value of y = 24 at x = 32.

V.S. +15

amp = 9



$y = -9\cos\left(\frac{\pi}{32}x\right) + 15$

or

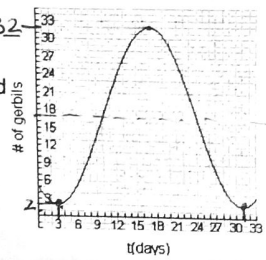
$y = 9\sin\left(\frac{\pi}{32}(x-16)\right) + 15$

period $\frac{2\pi}{b} = 64$

$\frac{2\pi}{64} = \frac{64b}{64}$

$\frac{\pi}{32} = b$

A pet store clerk noticed that the population in the gerbil habitat varied sinusoidally with respect to time in days. He carefully collected data and graphed his resulting equation.



y = 17

a. Amplitude = 15

b. Period = 28

c. Frequency = $\frac{1 \text{ wave}}{28 \text{ days}}$

d. Equation

$y = 15\cos\left(\frac{\pi}{14}(t-3)\right) + 17$

$y =$

$28 = \frac{2\pi}{b}$ $28b = \frac{2\pi}{28} = \frac{\pi}{14}$

20

10

0

Ken is riding a ferris wheel. H(t) models his height (in m) above the ground, t seconds after the ride starts. Here, t is entered in radians.

$$H(t) = -10\cos\left(\frac{2\pi}{150}t\right) + 10$$

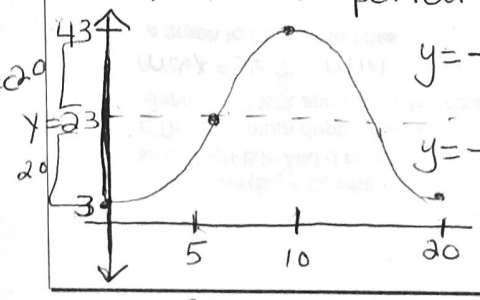
1. What is the period? $\frac{2\pi}{\frac{2\pi}{150}} = 2\pi \cdot \frac{150}{2\pi} = 150\text{sec}$
2. When does Ken first reach a height of 16 m? $\approx 52.86\text{sec}$
3. What is the maximum height the ferris wheel reaches? 20m
4. What is the minimum height? 0m

#2 $16 = -10\cos\left(\frac{2\pi}{150}t\right) + 10$

As a Ferris wheel turns, the distance a rider is above the ground varies sinusoidally with time. The highest point on the wheel is 43 feet above the ground. The wheel makes a full circle every 20 seconds and has a diameter of 40 feet. Write a function to model the rider's height versus time. d = 40ft.

max = 43ft. period = 20sec.

amp = 20



$y = -20\cos\left(\frac{\pi}{10}t\right) + 23$

$y = -20\sin\left[\frac{\pi}{10}(t-5)\right] + 23$

$20 = \frac{2\pi}{b}$ $b = \frac{2\pi}{20} = \frac{\pi}{10}$

Radian Mode

An athlete was having her blood pressure monitored during a workout. Doctors found that her maximum blood pressure, known as systolic, was 110 and her minimum blood pressure, known as diastolic, was 70. If each heartbeat cycles takes 0.75 seconds, then determine a sinusoidal model in the form y = Asin(Bt) + C, for her blood pressure as a function of time t in seconds. max = 110 period = .75 min = 70

Using your equation, what is the athletes blood pressure after 25 seconds?

$y = 20\sin\left(\frac{8\pi}{3}t\right) + 90$

107.32 mm

$\frac{3}{4} = \frac{2\pi}{b}$

$3b = 8\pi$

$b = \frac{8\pi}{3}$

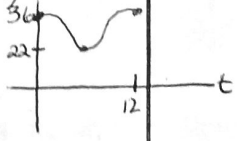
The tides in a particular bay can be modeled with an equation of the form d = Acos(Bt) + C, where t represents the number of hours since high-tide and d represents the depth of water in the bay. The maximum depth of water is 36 feet, the minimum depth is 22 feet and high-tide occurs every 12 hours. max = 36 min = 22 period = 12

a. Sketch a graph to model the tides

b. Write an equation

c. What is the depth of the water when t = 4?

$\frac{2\pi}{b} = 12$ $b = \frac{\pi}{6}$

a) 

b) $d = 7\cos\left(\frac{\pi}{6}t\right) + 29$

c) $d(4) = 7\cos\left(\frac{\pi}{6}\cdot 4\right) + 26$

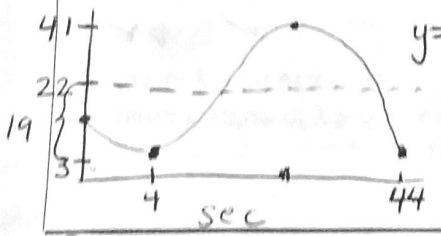
$d(4) = 25.5\text{ ft.}$

You go to the carnival and decide to ride the Ferris Wheel. The wheel is 3ft off of the ground and the diameter of it is 38ft. The wheel makes a revolution every 40 seconds. You are at the lowest point after 4 seconds.

a. Draw a graph

b. Write a function

c. How high will you be after 12 seconds?



$y = -19\cos\left[\frac{\pi}{20}(t-4)\right] + 22$

(12, 16.129 ft.)

$40 = \frac{2\pi}{b}$ $b = \frac{\pi}{20}$

Astronomers have noticed that the number of visible sunspots varies from a minimum of about 10 to a maximum of about 110 per year. Further, this variation is sinusoidal, repeating over an 11 year period. If the last maximum occurred in 2003, write a cosine function which models this phenomenon in terms of the time t which represents the year.