You may choose your own seats, but please don't leave open tables in the front/middle of the room.

6.4 More Ferris Wheels

A Solidify Understanding Task

In a previous task, *"Sine" Language*, you calculated the height of a rider on a Ferris wheel at different times t, where t represented the elapsed time after the rider passed the position farthest to the right on the Ferris wheel.

Recall the following facts for the Ferris wheel in the previous tasks:

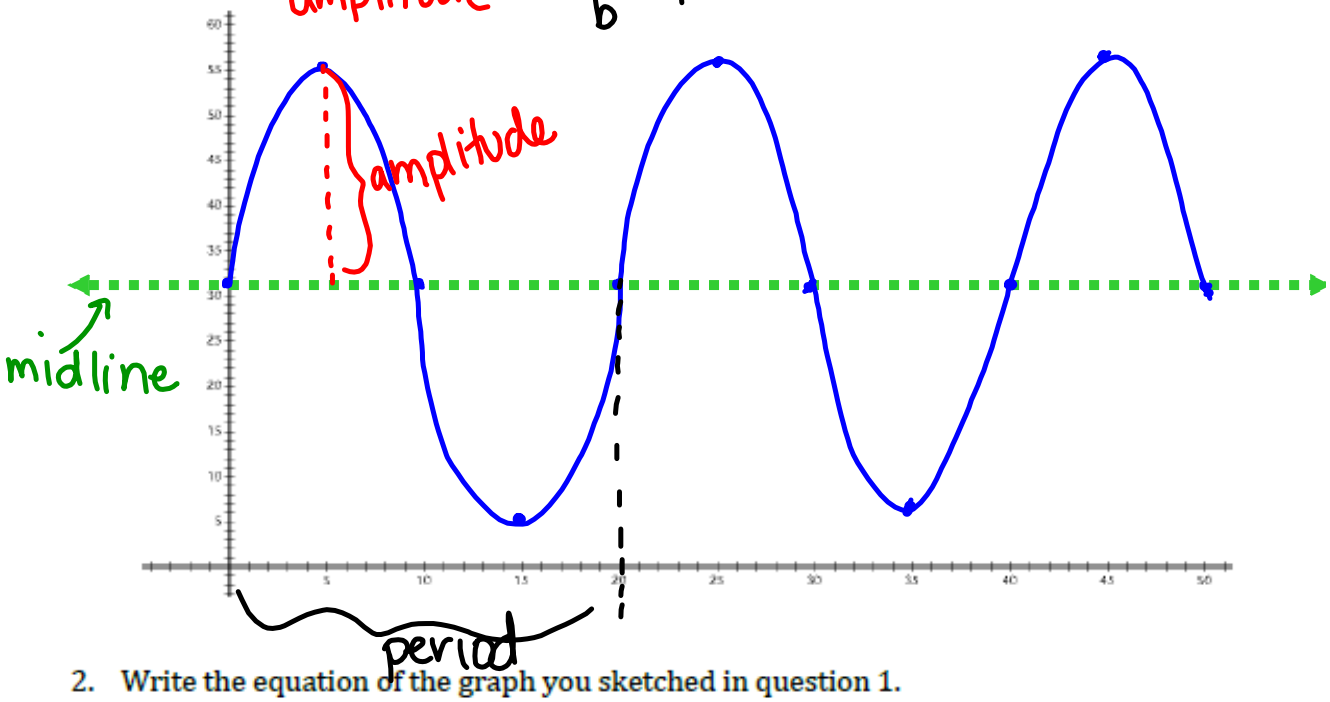
- The Ferris wheel has a radius of 25 feet
- The center of the Ferris wheel is 30 feet above the ground
- The Ferris wheel makes one complete rotation counterclockwise every 20 seconds

1. Based on the data you calculated, as well as any additional insights you might have about riding on Ferris wheels, sketch a graph of the height of a rider on this Ferris wheel as a function of the time elapsed since the rider passed the position farthest to the right on the Ferris wheel. (We can consider this position as the rider's starting position at time $t = 0$.)

$f(x) = a\sin(bx) + c$ ← midline

amplitude

$\frac{360}{b}$ = period



2. Write the equation of the graph you sketched in question 1.

$h(t) = 30 + 25\sin(18t)$

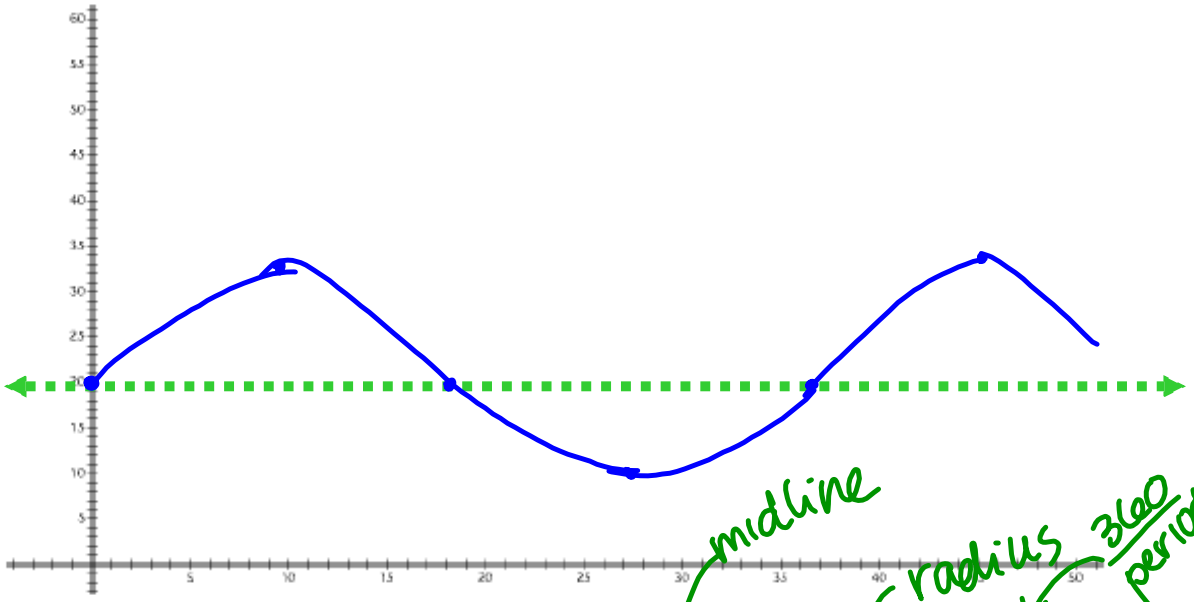
3. Of course, Ferris wheels do not all have this same radius, center height, or time of rotation. Describe a different Ferris wheel by changing some of the facts listed above. For example, you can change the radius of the wheel, or the height of the center, or the amount of time it takes to complete one rotation. You can even change the direction of rotation from counterclockwise to clockwise. If you want, you can change more that one fact. Just make sure your description seems reasonable for the motion of a Ferris wheel.

center = 20

Description of my Ferris wheel:

36 sec rotation
radius = 10

4. Sketch a graph of the height of a rider on your Ferris wheel as a function of the time elapsed since the rider passed the position farthest to the right on the Ferris wheel.

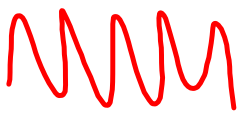


5. Write the equation of the graph you sketched in question 4.

$h(t) = 20 + 10\sin(10t)$

6. We began this task by considering the graph of the height of a rider on a Ferris wheel with a radius of 25 feet and center 30 feet off the ground, which makes one revolution counterclockwise every 20 seconds. How would your graph change if:

- the radius of the wheel was larger or smaller?
  how high or low the max & min are
- the height of the center of the wheel was greater or smaller?
  shifts graph ↑ or ↓
- the wheel rotates faster or slower?
  changes period or wavelength



$f(x) = a\sin(bx) + c$

7. How does the equation of the rider's height change if:

   - the radius of the wheel is larger or smaller?

changes a

   - the height of the center of the wheel is greater or smaller?

changes c

   - the wheel rotates faster or slower?

changes $\frac{360}{\text{period}} = b$

8. Write the equation of the height of a rider on each of the following Ferris wheels t seconds after the rider passes the farthest right position.

   a. The radius of the wheel is 30 feet, the center of the wheel is 45 feet above the ground, and the angular speed of the wheel is 15 degrees per second counterclockwise.

$h(t) = 45 + 30\sin(15t)$

   b. The radius of the wheel is 50 feet, the center of the wheel is at ground level (you spend half of your time below ground), and the wheel makes one revolution *clockwise* every 15 seconds.

$h(t) = 0 - 50\sin(24t)$

$h(t) = -50\sin(24t)$ $\frac{360}{15} =$

Homework

Finish 6.4 "Ready, Set, Go"