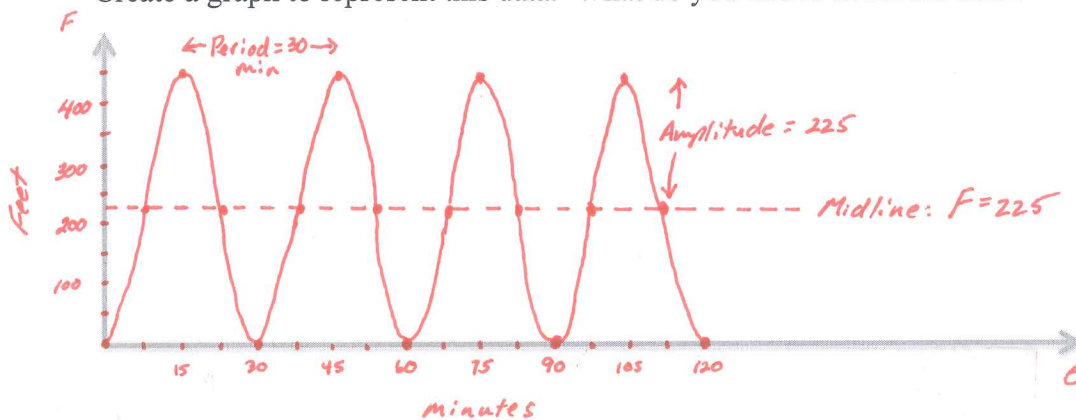


Sec. 7.1 Introduction to Periodic Functions

Ex. The London Eye Ferris Wheel measures 450 feet in diameter and turns continuously, completing a single rotation once every 30 minutes. Suppose you hop on the London Eye Ferris wheel at time $t = 0$ and ride it for two full turns. Let $f(t)$ be your height above the ground, measured in feet as a function of t , the number of minutes you have been riding. We can figure out some values of $f(t)$. Since the speed of the rotation is constant, you are at the top 15 minutes after boarding and one-quarter of the way up at 7.5 minutes and 22.5 minutes after boarding. Then you are back at the bottom after 30 minutes and the process continues.

T(min)	0	7.5	15	22.5	30	37.5	45	52.5	
F(t)(ft)	0	225	450	225	0	225	450	225	
T(min)	60	67.5	75	82.5	90	97.5	105	112.5	120
F(t)(ft)	0	225	450	225	0	225	450	225	0

Create a graph to represent this data. What do you notice about the data?

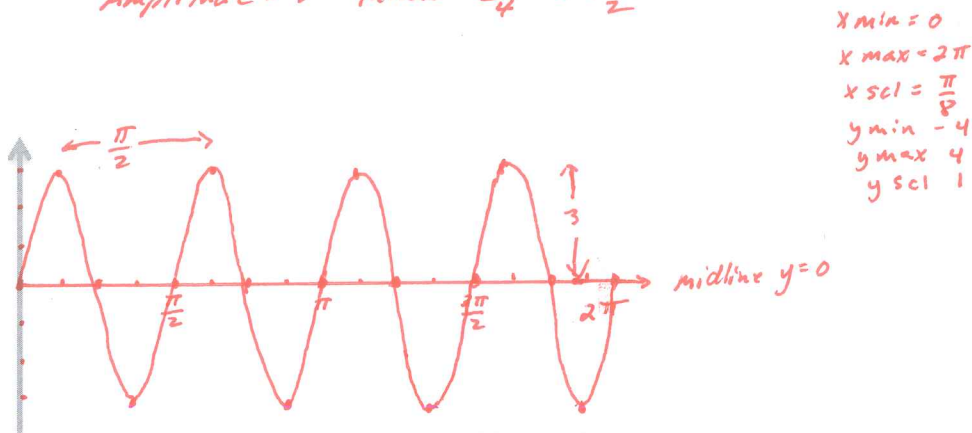


Theorem: If $w > 0$, the amplitude and period of $y = A \sin(wx)$ and $y = A \cos(wx)$ are given by:

$$\text{Amplitude} = |A| \quad \text{and} \quad \text{Period} = T = \frac{2\pi}{w}$$

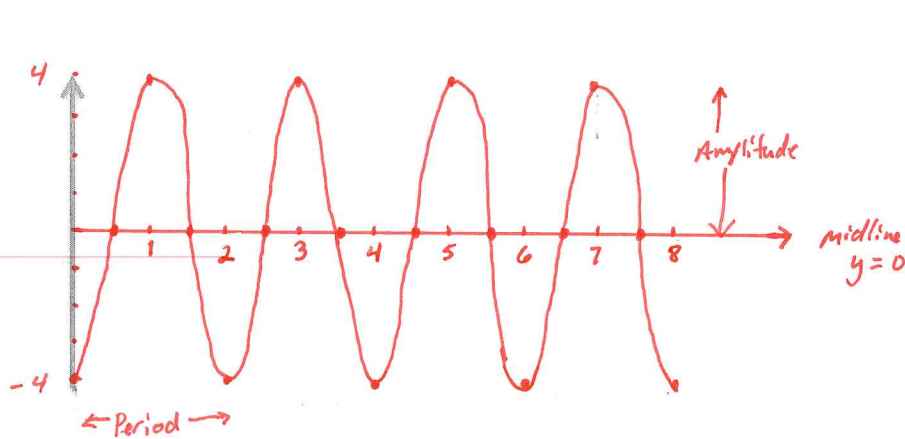
Ex. Find the amplitude and period of $y = 3 \sin(4x)$ and then graph the function.

$$\text{Amplitude} = 3 \quad \text{Period} = \frac{2\pi}{4} = \frac{\pi}{2}$$



Ex. Determine the amplitude and period of $y = -4 \cos(\pi x)$ and graph the function.

Amplitude = 4 Period = $\frac{2\pi}{\pi} = 2$ Reflect vertically across x



NOTE: If you are given the graph of the function and need to find an equation, find the amplitude, the period, and determine which function the graph was transformed from.

The Ferris Wheel function, f , is said to be periodic, because its values repeat on a regular interval or period. In the figure, the period is indicated by the horizontal gap between the first two peaks. The dashed horizontal line is the midline of the graph of f . The vertical distance shown between the first peak and the midline is called the amplitude.

