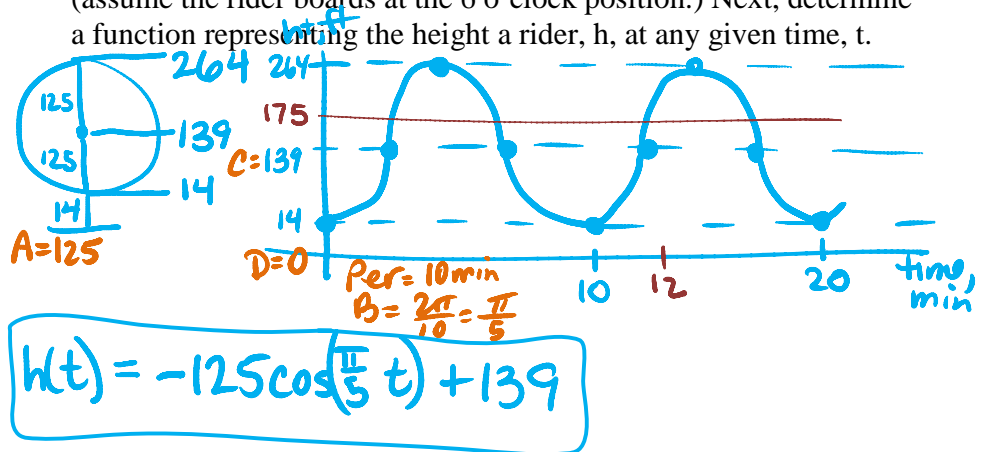


4.4 - Sinusoidal Word Problems

1) The Ferris Wheel was the engineering highlight of the exposition and one of the most pervasive, lasting influences of the 1893 fair. The Ferris Wheel was Chicago's answer to the Eiffel Tower, the landmark of the 1889 Paris exhibition. The wheel was created by Pittsburgh, Pennsylvania bridge builder George W. Ferris. Supported by two 140 foot steel towers, its 45 foot axle was the largest single piece of forged steel at the time in the world. The wheel itself had a diameter of 250 feet, a circumference of 825 feet, and the maximum height was 264 feet. It was powered by two 1000 horsepower reversible engines. It had 36 wooden cars that could each hold 60 people. It took 20 minutes to complete 2 full revolutions. The Ferris Wheel grossed \$726,805.50 during its short time in operation, at 50 cents per ride. The profit of approx. \$300,000 was of great benefit toward balancing the books of the exposition. The wheel was dismantled in mid-1894, after the fair, and reused at the St. Louis exposition in 1904. The original Ferris Wheel was scrapped in 1906. But, the influence of the engineering and entertainment marvel can be readily seen by the large number of Ferris Wheels of various types at fairs and entertainment grounds around the world.



a) Sketch a diagram of the path of the rider on the Ferris wheel (assume the rider boards at the 6 o'clock position.) Next, determine a function representing the height a rider, h , at any given time, t .



b) After riding the Ferris wheel for 12 minutes, what was the rider's height above the ground?

$x=12$ VALUE $y=100.4$ ft

c) At what time(s) will the rider be 175ft. above the ground?

$y_2=175$ Intersect
 $x=3$ mins, 7 mins, 13 mins, 17 mins

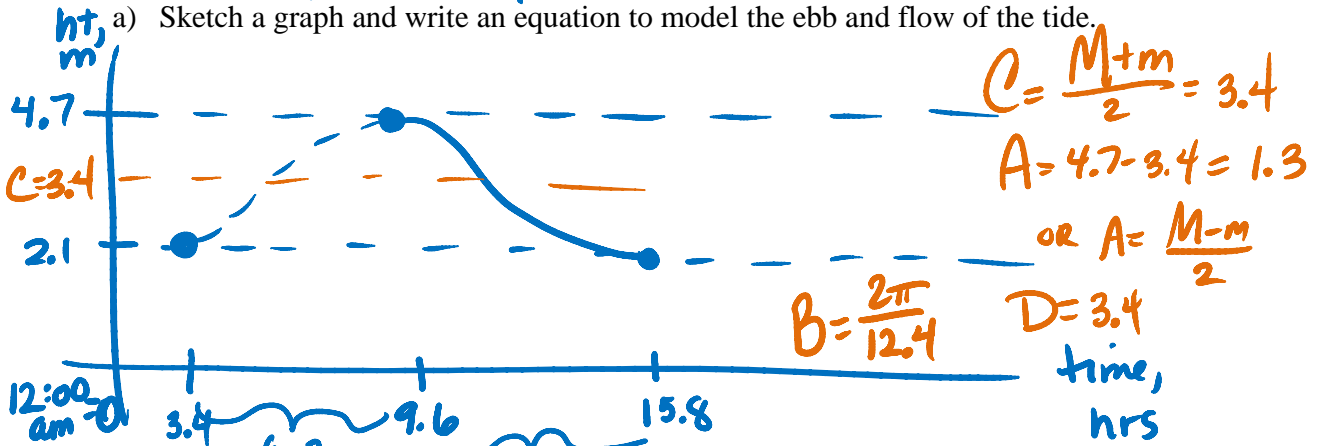
Ebb and Flow of the Tide = 9.6 hrs

- 2) On the 4th of July in Galveston Texas, high tide occurred at 9:36 A.M. At that time the water at the end of the 61st Street Pier was 4.7 meters deep. Low tide occurred at 3:48 P.M. at which time the water was only 2.1 meters deep. Assume that the depth of the water is a sinusoidal function of time with a period of half a lunar day (about 12 hours and 24 minutes).

Per = 12.4 hrs

15.8 hrs

- a) Sketch a graph and write an equation to model the ebb and flow of the tide.



- b) At what time on the 4th of July did the first low tide occur?

→ 3:24 am

$$y = -1.3 \cos\left(\frac{2\pi}{12.4}(x - 3.4)\right) + 3.4$$

- c) What was the approximate depth of the water at 6:00 A.M. and at 3:00 P.M. that day?

VALUE

$x = 6$

$x = 15$

$y = 3.1 \text{ m}$

$y = 2.2 \text{ m}$

- d) What was the first time on July 4th when the water was 3.1 meters deep?

$y_2 = 3.1 \text{ m}$

Intersect $x = 0.76 \text{ hours}$

$= 46 \text{ mins}$

$12:46 \text{ AM}$