GSE Accel. Precalculus **Sinusoidal Modeling Quiz Review WS #2**

1) A weight is attached to the end of a spring. As it bounces, its distance from the floor varies sinusoidally with time. When the stopwatch reads 0.3 seconds, the weight reaches a high point at 50 cm above the floor. The next low point, 30 cm above the floor, occurs at 1.8 seconds.

Write an equation that models the height of the weight as a function of time.

2) A portion of a roller coaster track is to be built in the shape of one full period of a sinusoid (from one minimum point to the next minimum point). You have been hired to calculate the lengths of the horizontal and vertical timer supports. The high and low points on the track are separated by 50 meters horizontally and 30 meters vertically. The low point is 3 meters above the ground.

a. Let the first minimum point be found at $(0,3)$. Write an equation that models the path of the track.

b. A vertical support is needed at $x = 10$ meters. How tall should this support be?

3) As a wave passes by an offshore piling, the height of the water is modeled by the function

$$h(t) = 3\cos\left(\frac{\pi}{10}t\right)$$

where $h(t)$ is the height in feet above mean sea level at time t seconds.

a. Find the period of the wave. Using correct units, explain what this value represents.

b. Find the wave height (the vertical distance between the trough and the crest of the wave)

4) A tuning fork is struck, producing a pure tone as its tines vibrate. The vibrations are modeled by the function

$$v(t) = 0.7\sin(880\pi t)$$

where $v(t)$ is the displacement of the tines in millimeters at time t seconds.

Find the period of the vibration.

5) At a particular beach on August 2, you find that at 2:00 pm (high tide), the depth of the water at the end of a pier is 1.5 meters. At 7:30 pm (low tide), the depth of the water is 1.1 meters. Assume that the depth varies sinusoidally with time.

a. Find an equation expressing depth as a function of the time that has elapsed since 12:00 am midnight at the beginning of August 2.

b. Use this model to predict the depth of the water at 5:00 pm on August 3.

6) Mark Twain sat on the deck of a river steamboat. As the paddle wheel turned, a point on the paddle blade moved so that its distance, d, from the water's surface was a sinusoidal function of time. When Twain's stopwatch read 4 s, the point was at its highest, 16 ft above the water's surface. The wheel's diameter was 18 ft, and it completed a revolution every 10 s.

a. Sketch the graph of the sinusoid.

b. Find a sinusoidal function that models the height d as a function of time t.

c. How far above the surface was the point when the stopwatch read 17 s?