Name: _____ Date: _____

7-7 SINUSOIDAL MODELING
HOMEWORK

APPLICATIONS

1. A ball is attached to a spring, which is stretched and then let go. The height of the ball is given by the sinusoidal equation $y = -3.5\cos\left(\frac{4\pi}{5}t\right) + 5$, where y is the height above the ground in feet and t is the number of seconds since the ball was released.

   (a) At what height was the ball released at? Show the calculation that leads to your answer.

   (b) What is the maximum height the ball reaches?

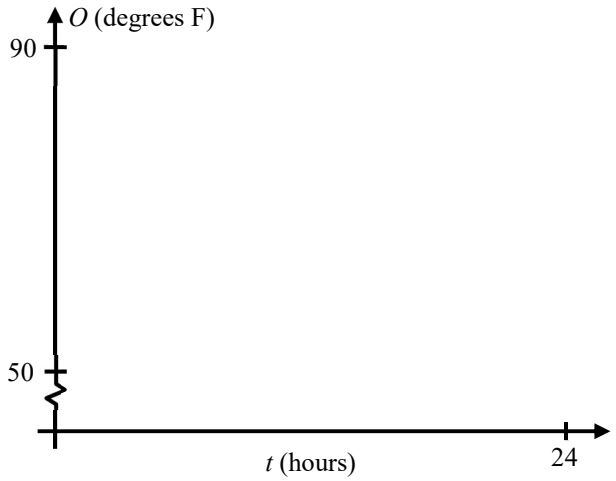
   (c) How many seconds does it take the ball to return to its original position?

   (d) Draw a rough sketch of one complete period of this curve below. Label maximum and minimum points.

2. 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 cycle takes 0.75 seconds, then determine a sinusoidal model, in the form $y = A\sin(Bt) + C$, for her blood pressure as a function of time t in seconds. Show the calculations that lead to your answer.

3. On a standard summer day in upstate New York, the temperature outside can be modeled using the sinusoidal equation $O(t) = 11\cos\left(\frac{\pi}{12}t\right) + 71$, where t represents the number of hours since the peak temperature for the day.

   (a) Sketch a graph of this function on the axes below for one day.



   (b) For $0 \le t \le 24$, graphically determine all points in time when the outside temperature is equal to 75 degrees. Round your answers to the nearest tenth of an hour.

4. The percentage of the moon's surface that is visible to a person standing on the Earth varies with the time since the moon was full. The moon passes through a full cycle in 28 days, from full moon to full moon. The maximum percentage of the moon's surface that is visible is 50%. Determine an equation, in the form $P = A\cos(Bt) + C$ for the percentage of the surface that is visible, P, as a function of the number of days, t, since the moon was full. Show the work that leads to the values of A, B, and C.

5. Evie is on a swing thinking about trigonometry (no seriously!). She realizes that her height above the ground is a periodic function of time that can be modeled using $h = 3\cos\left(\frac{\pi}{2}t\right) + 5$, where t represents time in seconds. Which of the following is the range of Evie's heights?

   (1) $2 \le h \le 8$ (3) $3 \le h \le 5$

   (2) $4 \le h \le 8$ (4) $2 \le h \le 5$ _____