APPLICATION PROBLEMS **NAME:**

SHOW ALL WORK & LABEL GRAPHS APPROPRIATELY.

1. The temperature in an office is controlled by an electronic thermostat. The temperatures vary according to the sinusoidal function:

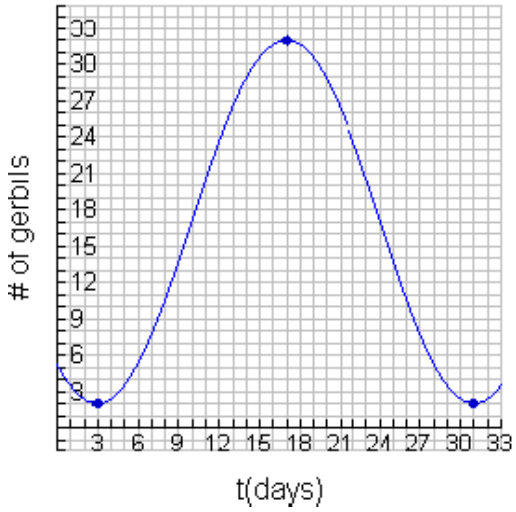
$$y = 19 + 6\sin\left(\frac{\pi}{12}(x-11)\right)$$ where *y* is the temperature(ºC) & *x* is the time in hours past midnight.

a.) What is the temperature in the office at 9 A.M. when employees come to work?

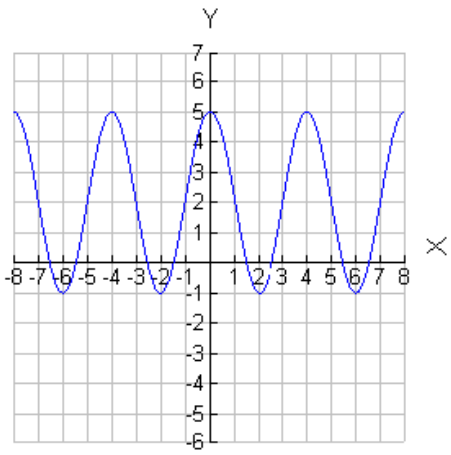
b.) What are the maximum and minimum temperatures in the office?

2. The number of hours of daylight measured in one year in Ellenville can be modeled by a sinusoidal function. During 2006, (not a leap year), the longest day occurred on June 21 with 15.7 hours of daylight. The shortest day of the year occurred on December 21 with 8.3 hours of daylight. Write a sinusoidal equation to model the hours of daylight in Ellenville. Use days as your x-axis, where x = 0 on June 21st.

3. A pet store clerk noticed that the population in the gerbil habitat varied sinusoidally with respect to time, in days. He carefully collected data and graphed his resulting equation. From the graph, determine the amplitude, period, horizontal shift & vertical shift. Write the <u>sine</u> equation of the graph.



4. Write both a sine and cosine equation for the following graph.



5. A team of biologists have discovered a new creature in the rain forest. They note the temperature of the animal appears to vary sinusoidally over time. A maximum temperature of 125 ° occurs 15 minutes after they start their examination. A minimum temperature of 99 ° occurs 28 minutes later. The team would like to find a way to predict the animal's temperature over time in minutes. Your task is to help them by creating a graph of one full period and an equation of temperature as a function over time in minutes.

6. The angle of inclination of the sun changes throughout the year. This changing angle affects the heating and cooling of buildings. The overhang of the roof of a house is designed to shade the windows for cooling in the summer & allow the sun's rays to enter the house for heating in the winter.

The sun's angle of inclination at noon in central New York state can be modeled by the formula:

$$\text{Angle of inclination (in degrees)} = -23.5\cos\left(\frac{360}{365}(x+10)\right)+47$$

where x is the number of days elapsed in the day of the year, with January first represented by $x = 1$, January second represented by $x = 2$, and so on.

Find the sun's angle of inclination at noon on Valentine's Day.