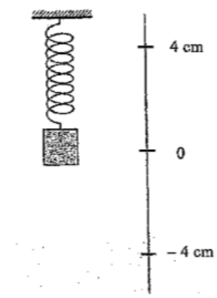
5-5 Homework Name ________________________

Pre-Calculus

1. A mass on a spring oscillates back and forth and completes one cycle in 0.8 seconds. The maximum displacement is 4 cm. Write an equation that models this motion. (Assume the mass begin in the middle.)



2. Mark Twain sat on the deck of a rive steamboat. As the paddle wheel turned, a point on the paddle blade moved to that its distance, d, from the water's surface was a sinusoidal function of time. When Twain's stopwatch read 4 seconds the point was at its highest, 16 feet above the water's surface. The wheel's diameter was 18 feet, and it completed one revolution (1 cycle) every 10 seconds.

a) Sketch a graph to model the distance above the water's surface of the point on the paddle over time.

b) What is the lowest the point goes? What is it reasonable for this point to be negative?

c) Determine the sinusoidal equation that models the distance of the point above the water's surface as a function of time.

d) How far above the surface was the point when Mark's stopwatch read 17 seconds?

e) What is the first positive value of t at which the point was at the water's surface? At that time, was the point going into or coming out of the water? How can you tell?

3. For several hundred years, astronomer have kept track of the number of solar flares, or "sunspots", which occur on the surface of the sun. The number of sunspots counted in a given year varies periodically from a minimum of about 10 per year to a maximum of about 110 per year. Between the maximums that occurred in the years 1750 and 1948 there were 18 complete cycles.

a) What is the period of the sunspot cycle?

b) Assume that the number of sunspots counted in a year varies sinusoidally with the year. Sketch a graph of two sunspot cycles, starting in 1948.

c) Write an equation expressing the number of sunspots per year in terms of years. Use an appropriate value for the phase shift.

d) How many sunspots would you expect in the year 2000?

e) What is the first year after 2000 in which the number of sunspots will be about 35?

4. The table below indicates the percent of the moon that is illuminated for the days of a particular month. All measurements were taken at the same latitude. A 100% illumination would be a full moon.

Day	1	4	7	10	13	16	19	22	25	28	31
% Illum.	28	55	82	99	94	68	34	9	0	9	30

a) Use a graphing calculator to find a sinusoidal regression model.

b) Use the model to determine what percent of the moon is illuminated on day 20.

c) On which days of the month would a half moon occur? Explain.

5. The number of daylight hours per month (as measured on the 15th of each month) is shown in the table for the cities of Beaumont, Texas and Minneapolis, Minnesota.

a) Use the data to find a sinusoidal regression model of the daylight hours for EACH city.

b) Graph both equations on the same grid and use the graph to estimate the number of days each year that Beaumont receives more daylight hours that Minneapolis. (use one month = 30.5 days)

Month (Jan = 1)	TX	MN
1	10.4	9.1
2	11.2	10.4
3	12.0	11.8
4	12.9	13.5
5	14.4	16.2
6	14.1	15.7
7	13.9	15.2
8	13.3	14.2
9	12.4	12.6
10	11.5	11.0
11	10.7	9.6
12	10.2	8.7