Mathematical Modeling
Math 230

1. **Get to know your group.** We will often use groups for in-class problem solving. We'll change the groups in about a week.

    (a) Introduce yourself to your group.

    (b) Find out something interesting about each of your group members.

2. **Spread of a rumor.** Consider the following assumption: *In a city with a fixed population of P persons, the rate of change of the number of people who have heard a certain rumor is proportional to the number who have not heard the rumor.*

    (a) Based on the assumption above, what quantities are necessary to incorporate into the population model? Choose a symbol to represent each quantity.

    (b) Use your notation from part (a) to convert the assumption to a differential equation.

    (c) Without solving the differential equation, can you sketch the general shape of the solution graph?

    (d) What additional assumptions, if any, did you make in the process above?

3. **Population model with a carrying capacity.** Assumptions: *If a population size is small, then its rate of growth is proportional to its size. However, if the population is larger than some fixed carrying capacity, then its growth rate is negative.* Follow steps (a) through (d) above to build a differential equation that models this scenario.

4. **Deer population.** Assumptions: *A population of deer live in an area with a carrying capacity of 10,000 deer. If the population is small, then the population grows in proportion to its size. If the population is larger than the carrying capacity, then its growth rate is negative. In addition, one tenth of the deer are taken by hunters each year.* Follow steps (a) through (d) above to build a differential equation that models this scenario.