In-Class

1. Consider the spreading of a rumor through a company of 1000 employees, all working in the same building. We assume that the spreading of a rumor is similar to the spreading of a contagious disease in that the number of people hearing the rumor each day is proportional to the product of the number who have heard the rumor previously and the number who have not heard the rumor. This is given by

$$x_{n+1} = x_n + kx_n(1000 - x_n)$$

where k is a parameter that depends on how fast the rumor spreads and n is the number of days.

   (a) Assume $k = 0.001$ and that four people initially have heard the rumor. How soon will all 1000 employees have heard the rumor?

   (b) Now assume a company with 2000 employees. Build a model for the company with the following rumor growth rates to determine the number who have heard the rumor after 1 week.

      i. $k = 0.25$
      ii. $k = 0.025$
      iii. $k = 0.0025$
      iv. List some ways of controlling the growth rate.

2. Assume we are considering the survival of whales and that if the number of whales falls below a minimum survival level m, the species will become extinct. Assume also that the population is limited by the carrying capacity M of the environment. That is, if the whale population is above M, then it will experience a decline because the environment cannot sustain that large a population level. In the following model, x_n represents the whale population after n years. Build a numerical solution for $M = 5000, m = 100, k = 0.0001$, and $x_n = 4000$.

$$x_{n+1} = x_n + k(M - x_n)(x_n - m)$$

Now experiment with different values for M, m and k. Try several starting values for x_n. What does your model predict?