Problem Set 1   Differential Equations   Due 1/26/04

You are encouraged to work in groups of two to four on this assignment and make a single group submission. Each problem is worth 5 points. For full credit indicate clearly how you reached your answer. All work must be legible and submitted on clean paper without ragged edges.

1. Suppose that the population of a certain kind of fish is governed by a logistic growth model with a carrying capacity of 2.5 million fish. Write the corresponding differential equation and find
      (a) the general solution.
      (b) a particular solution corresponding to the initial condition $P(0) = 2$.

2. Suppose that, due to exhaustion of other commercially fished species, our fish population from problem 1 begins to be harvested at a continuous rate of 100,000 fish per year. Plot a slope field for this new situation and compare it with the previous situation. Give a good description of the qualitative changes to the behavior of solutions to the new differential equation.

3. Suppose that during the rehearsal for a wedding to be held in the garden of Clark Alumni House several small children urinate in the fountain. The fountain has a small filtration system that removes contaminants at a continuous rate of 5% per hour. If the fountain holds 100 cubic feet of water and the children deposited half a cubic foot of urine in the fountain, use Euler's method to estimate the amount of urine in the fountain 24 hours later when the wedding pictures are taken in front of the fountain.