Problem Set 6 Calculus 2 Due 4/24/07

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 fish population in a lake is modeled by the differential equation

$$\frac{dp}{dt} = 0.2p(5-p),$$

where p is in thousands.

   a) What is the carrying capacity of this population?

   b) How many years will it take to reach the carrying capacity?

2. Suppose that now we begin harvesting the fish population at a steady rate h (in thousands of fish per year), so now the differential equation becomes

$$\frac{dp}{dt} = 0.2p(5-p) - h.$$

Suppose that the population begins at $p(0) = 1$.

   a) If h is 0.5, what happens to the population over the long term?

   b) If h is 0.9, what happens to the population over the long term?

   c) For which value of h will the population remain steady?

   d) Does the value from part c) above depend on the starting population?