

Math 026L.01 Spring 2000

Applications and Modelling

April 3, 2000

**1.** Suppose a water reservoir holds 100 million gallons of water and supplies a city with 1 million gallons a day. The reservoir is partly refilled by a spring which provides 0.9 million gallons a day, and the rest of the water, 0.1 million gallons a day, comes from run-off from the surrounding land. The spring is clean, but the run-off contains salt with a concentration of 0.0001 pounds per gallon. Assume that there was no salt in the reservoir initially and that the reservoir is well-mixed.

(a) Find the quantity of salt in the reservoir as a function of time.

(b) Find the concentration of salt in the reservoir as a function of time.

(c) What is the concentration of salt after 30 days? In the long run? What about the quantity?

*(Hint: See page 525.)*

**2.** Biologists stocked a lake with 400 fish and estimated that the maximum population for such fish in this lake is 10000. Suppose that the number of fish tripled in the first year.

(a) Assuming that the size of the fish population satisfies the logistic equation, find an expression for the size of the population after  $t$  years.

(b) How long will it take for the population to increase to 5000?