Math 155. Homework 10. Sections 4.2 and 4.3.

1. Suppose that a bacterium is absorbing a certain drug from its environment. At time $t = 0$, there is 0.2 mol of drug in the bacterium, and drug enters the bacterium at a rate of $\frac{1}{1+t^2}\,\frac{\text{mol}}{\text{min}}$

   (a) Let $c(t)$ represent the amount (mol) of drug in the bacterium at time t (minutes). Write a pure-time differential equation and an initial condition for the situation described above.

   (b) Apply Euler's Method with $\Delta t = 0.5$ to estimate the amount of drug in the bacterium at time $t = 1.5$. Show your work clearly using a table.

2. Let $L(t)$ = the length (in cm) of a fish at time t (in years). Suppose that the fish grows at a rate $\frac{dL}{dt} = 5.0\mathrm{e}^{-0.2t}$.

   (a) Determine the total change in length of the fish between times $t = 5$ and $t = 10$. (Suggestion: First solve the differential equation.) Does the answer to this question depend on the initial condition $L(0)$?

   (b) Determine $L(t)$ if $L(0) = 2$.

   (c) What is $\lim_{t\to\infty} L(t)$ if $L(0) = 2$?