**MATH 172** **Fall, 2011** **Quiz #2** **Name:**____________________

1. Give the updating equation (also known as the recurrence equation) for the length $\ell_n$ of a chain of $n$ grocery buggies, where each buggy is 3.5 feet long, and when you push a new buggy into the chain, only 6 inches sticks out. Note that the pattern doesn't really begin until you actually have a buggy, so $\ell_0$ is not defined, $\ell_1 = 3.5$, and $\ell_2 =$ ______ , $\ell_3 =$ ______ . Then give the solution equation for $\ell_n$ in terms of $n$.

2. During the 1980's Costa Rica had the highest deforestation rate in the world at 2.9% per year. Deforestation (meaning loss of forested land) is a continuous process.
   a. If $F(t)$ is the amount of forested land, write the model equation for this process.

   b. Give the explicit solution to this equation.

(over $\rightarrow$)

3. Suppose a population $B(t)$ of bacteria is growing over time so that the **per capita** rate of increase is 0.2% per hour. At the same time 4 mg of the bacteria are withdrawn per hour. Assume that this process take place continuously. (There is a vessel designed for this purpose called a chemostat.)

   a. Write the model equation that describes this situation.

   b. Is there a steady state or equilibrium value for the amount of bacteria? If so, compute it.

   c. What will happen to an initial population of 1000 mg?