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 \( \ell_2 = \quad \), \( \ell_3 = \quad \). 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 →)
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 At the same time 4 mg of the bacteria are withdrawn per hour.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?