Math Xb Spring 2004
Worksheet: Introducing Differential Equations
May 3, 2004

1. Suppose the population of a bacteria colony can be modeled by the differential equation

$$\frac{dP}{dt} = \frac{P}{8}.$$

   (a) Find the particular solution to this differential equation corresponding to the initial condition $P(0) = 1000$. Describe in words how the population changes over time.

   (b) Find the particular solution to this differential equation corresponding to the initial condition $P(10) = 1000$. Describe in words how the population changes over time.

2. Suppose the population of a bacteria colony can be modeled by the differential equation

$$\frac{dP}{dt} = kP.$$

   Suppose also that when the colony has a population of 500 bacteria, the colony is growing at a rate of 100 bacteria per hour. If the colony has an initial population of 200 bacteria, find a formula for $P(t)$.

3. Suppose a hot cup of coffee is taken out of a microwave and placed on a table in a 70° Fahrenheit to cool. At this time the temperature of the coffee is 180° F. When the temperature of the coffee is 150° F, the temperature of the coffee is decreasing at a rate of 10° F per minute. Determine when the temperature of the coffee will be 80° F.