Section 5.2 Exponential Growth and Decay, Newton’s Law of Cooling

1. A certain type of bacteria increases continuously at a rate proportional to the number present. If there are 100 present at a given time and 300 present 5 hours later, how many will there be 10 hours after the initial given time?
2. In 1970 the population of a town was 2500, and in 1980 it was 3350. Assuming the population increases continuously at a constant rate proportional to the existing population, estimate the population in the year 2019.
3. If radioactive material decays continuously at aa rate proportional to the amount present, find the half-life of the material if after 1 year 99.57 percent of an initial amount still remains.

Use Newton’s Law of Cooling.

1. Determine the reading on a thermometer 5 minutes after it is taken from a room at 72° Fahrenheit to the outdoors where the temperature is 20°, if the reading dropped to 48° after 1 minute.
2. An object in a room at 70° cools from 350° to 150° in 45 minutes. Find the time necessary for the object to cool to 80°.
3. Determine the outdoor temperature if a thermometer is taken from a room where the temperature is 68° to the outdoors, where after ½ minute and 1 minute the thermometer reads 53° and 42°, respectively.
4. When an object is removed from a furnace and placed in an environment with a constant temperature of 90°, its core temperature is 1500°. One hour after it is removed, the core temperature is 1120°. Find the core temperature 5 hours after the object is removed for the furnace.