Lesson 17

1. A ball has the property that each time it falls from a height h onto the ground, it will rebound to a height of rh, where r $(0 < r < 1)$ is called the coefficient of restitution. Suppose for a given ball, $r = 0.5$.

   (a) Set up a series to find the total distance traveled by the ball in terms of the inital height, h.

   (b) If the ball is dropped from 13 feet, what is the total distance traveled by the ball?

   (c) If the total distance traveled by the ball is 20 feet, what is the inital height?

2. A patient is given an injection of 100 milligrams of a drug every 24 hours. After t days, the fraction of the drug remaining in the patient's body is $f(t) = 2^{-2.5t}$. Suppose the treatment is continued indefinitely.

   (a) What amount remains in the patient's body after n days?

   Approximately how many milligrams of the drug will eventually be in the patient's body:

   (b) just *prior* to an injection?

   (c) just *after* an injection?

3. A bank offers an annual interest rate of 1% for saving accounts, and interest is compounded continuously.

   (a) Write down the compound interest formula.

   (b) How much should you invest today so that starting next year, you can make annual withdrawals of $500 in perpetuity?

   (c) How much should you invest today if the interest rate is 10% instead?