1. You start with a 100g lump of a radioactive isotope. A year later the lump has a mass of 97.7g. What is the half life of the isotope?

2. At time $t = 0$ minutes, a colony of E. coli has 10000 cells. The population is growing exponentially, and after 60 minutes it has 90000 members. Find a function of the form

$$p(t) = C\, 10^{at}$$

that describes the population size.

3. The function $f(x) = 2^{-3x}$ can be written in the form $f(x) = 10^{-ax}$ for a certain constant a. Determine the value of a.

4. Use the change of base formula to rewrite $\log_{10}(7)$ in terms of the natural logarithm, ln.

5. Solve the following equation for x:

$$\ln(x) + \ln(x-1) = 2.$$

6. Find the inverse function of $f(x) = 1 + \sqrt{2-3x}$. Remember:

a) Write $y = f(x)$.

b) Solve for x.

c) The resulting expression in terms of y is $f^{-1}(y)$.