Math 115 Group Homework 2
Fall, 1999

1. The following table contains values for three functions f, g, and h, rounded to three places after the decimal. One of these functions is exponential, one is quadratic, and one is cubic. Find $f(2)$, $g(2)$, and $h(2)$.

x	$f(x)$	$g(x)$	$h(x)$
0.5	0.026	2.622	0.128
1.5	0.709	2.884	1.148
2.5	3.281	3.173	3.188
3.5	9.004	3.490	6.248
4.5	19.136	3.839	10.328

2. There are many reasons, particularly in human and veterinary medicine, for wanting to know the surface area of an animal. An animal's surface area can be very difficult to measure directly. However, it is known that for any given species of mammal, the surface area of an animal of that species is proportional to the 2/3 power of the mass of the animal. Furthermore, animal physiologists have determined the remarkable fact that the constant of proportionality is almost exactly the same for all different species of mammals.

   (a) Suppose that a particular kangaroo with mass 32.10 kilograms has a surface area of 1.111 square meters. Write an explicit formula for the surface area of a kangaroo in terms of its mass. Use meaningful letters for your variable names, rather than something boring like x and y, and be sure to tell the reader what the variable names mean; don't assume that it is obvious because of the letters you pick. (This should *always* be done whenever you select variable names.)

   (b) Suppose that the mass of former U.S. President (and Michigan alumnus) Gerald Ford is 105 kilograms. Find the approximate value of his surface area, in square meters. (Of course, you should be sure to state any assumptions you are making.)

3. Suppose that you are sitting in your 1997 C5 Chevy Corvette at a stop light, and at the instant the light turns green you floor it, so that you accelerate away as quickly as possible. Figure 2.36 on page 119 of your text gives your velocity v, in meters per second, t seconds later. Let $f(t) = v$.

   (a) Is f invertible? Explain.

   (b) For this particular example, explain in practical terms what information f^{-1} gives you.

   (c) Suppose that a friend interested in your Corvette's performance has asked you a question, and to find the answer you look up the value of $f^{-1}(40)$. What question did your friend ask, and what is your answer?

   (d) Sketch the graph of f^{-1}.

4. A population of bacteria is growing exponentially, so that at time $t = 0$ (where t is measured in *minutes*) there are 8×10^9 bacteria, and two *hours* later there are 3×10^{10}. (Notice the different units of time.) Let P be the number of bacteria after t minutes.

   (a) Find a formula for t in terms of P.

   (b) Use your formula to compute how long it will take, in minutes, before there are 10^{11} bacteria.

   (c) Use the formula you found in (a) to compute the doubling time, in minutes, for this population.