Written Homework 7

Math 111

Due March 13th at the start of class

Textbook Exercises:

Section 5: 2, 6, 8, 10, 14, 20, 22, 24, 26, 30, 32, 44, 46, 48

Section 6: 2, 4, 6, 8, 20, 22, 28, 52, 54

Exercise 1: The Richter scale measures the magnitude of earthquakes. An earthquake with intensity I has magnitude $M = R(I) = \log_{10} kI$, where k is some positive constant.

a) How many times more intense is a magnitude 8 earthquake than a magnitude 4 one?

b) What is the mathematical domain of R?

c) Sketch a graph of $R(I)$.

d) Express $R(I)$ in terms of only base 100 logarithms. Plug in a few points and make sure the numbers still line up.

e) Find and interpret R^{-1}.

f) One earthquake has intensity x, and a second has intensity $2x^2$. Express the magnitude of the second earthquake in terms of the magnitude of the first.

Exercise 2: Let $y = T(x) = e^{2x}$.

a) Find the mathematical domain of T.

b) Find the image of T by finding its inverse function.

c) Find the average rate of change of T on the interval $[0, 1]$.

d) Using your answer to part c), find an equation for the line that passes through the points on the graph of T that correspond to $x = 0$ and $x = 1$. Sketch a graph.

e) Now let a be a positive number and find the average rate of change of T on the interval $[0, a]$. This is a function of a — find its behavior as $a \longrightarrow 0$ with $a > 0$.

f) The value that you found in part e) is the slope of a line that touches the graph of T at exactly one point. Sketch this line. In what sense does it represent the slope of the graph at that point?