

Fall 2004 Calculus I, sections 4, 5, 6, Courant Institute of Mathematical Sciences, NYU.

## Homework 5, due October 11

**Self check** (not to hand in, answers are in the back of the book):

**Section 3.7:** 1, 5, 9, 15, 23, 29.

**Section 3.8:** 3, 9.

**Section 3.9:** 3, 9.

**To hand in:**

**Section 3.7:** 2, 4, 8, 10, 20, 26, 30, 44, 58.

**Section 3.8:** 2, 6, 18, 22, 32.

**Section 3.9:** 4, 10, 18.

**More problems** (to hand in) Define  $f(x) = \sqrt{x + \frac{1}{2}}$ .

1. Find the coefficients  $a$ ,  $b$ , so that  $l(x) = a + bx$  has the same value and derivative as  $f$  when  $x = 0$ .
2. Find the coefficients  $a$ ,  $b$ , and  $c$ , so that  $q(x) = a + bx + cx^2$  has the same value, first derivative, and second derivative as  $f$  when  $x = 0$ . Have the coefficients  $a$  and  $b$  changed from problem 1?
3. Make a carefully drawn graph showing the values of  $f$ ,  $l$ , and  $q$ , for the  $x$  values .1, .2, .3, .5, .7, 1. Make the  $x$  and  $y$  scales the same. Make the distance between  $x = 0$  and  $x = 1$  at least five inches. Draw the graph of  $l(x)$  with a ruler and sketch the other curves carefully.
4. From the graph in problem 3, how accurate are the linear and quadratic approximations to  $f$ , and over what range of  $x$  values are these approximations valid?
5. Comment on the sizes of the numbers  $f(x) - f(0)$ ,  $f(x) - l(x)$ , and  $f(x) - q(x)$ . Which are smaller for small  $x$ ?