MATH 104/184: Week 9 and 10 Fresh Sheet
November 3, 2013

Learning Goals

There is a midterm in Week 9. As well, in Week 10 the MWF classes will not have class on Monday because of the Remembrance Day holiday on November 11th.

We will start to work with Optimization Problems in section 4.4 of Briggs Cochran in Week 9 and spend all of Week 10 on this topic. There will be some extra business related optimization problems posted as well.

Some of you may be finishing up limits at infinity, infinity limits, and asymptotes from the Week 8 learning goals.

The specific learning goals for this section are that by the end of Week 10 and review homework, students should be able to:

1. interpret the idea of optimization as the procedure used to make a system or a design as effective or functional as possible, and translate it into a mathematical procedure for finding the maximum/minimum of a function;
2. set up an optimization problem by identifying the *objective function* and all appropriate *constraints*; and
3. use calculus to solve optimization problems, and explain how they used the constraints in the solution process.

Potential Learning Approaches and Issues

1. Many students have difficulty setting up optimization problems so they correctly identify the objective function (the function whose maximum or minimum you are trying to find) and *all* constraints. You should take great care to be explicit and organized in the way you set up problems: good bookkeeping helps you keep track of everything you need to do to solve the problems.
2. It is likely best to start your studying by working through basic examples such as Example 1 in section 4.4 of Briggs Cochran. You should work to understand what you are trying to find before tackling the mathematics of it. I suggest looking at the exercises for other examples; the problems tend to get harder later in the exercises.
3. Once you have set up the problem, be sure to explicitly state how you are using the constraints. This includes identifying *all* the constraints. There is a tendency to downplay or forget constraints like, for example, $x \geq 0$ for some quantity x in a problem because we take it for granted. However, you need to be explicit in how you present this to us in your work on exams. Many of the problems involve using one of the constraints to eliminate a variable in the problem to reduce it to a single-variable calculus situation. See Example 1 of section 4.4.
4. Simply finding critical points is not the end of solving an optimization problem. You need to show you have found an absolute maximum or minimum in these problems, and you will make use of the extreme-value theorem frequently, and one of the first or second derivative tests. You will also need to check things like singularities (e.g. $x = 0$ is a singularity for $f(x) = 1/x$).
5. Use the suggested problems to guide your study.

Suggested Problems and Assignments

Suggested Problems: This week, all suggested problems from the text are:

Chapter 4.4: 2, 3, 4, 8, 11, 13, 15, 16, 20, 23, 25, 31, 33, 48, 55, 57.

There will be a handful of extra problems posted on the website.

Webwork Homework: You will be asked to do WebWork assignments based on the material in weeks 9 and 10.