

MATH 104: Week 8 Learning Goals

October 23, 2017

Learning Goals

We will start to work with Optimization Problems in section 3.5 of the Course Notes. There will be some extra business related optimization problems posted as well.

The specific learning goals for this section are that by the end of Week 8, you 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.

Food for Thought As You Study This Week

1. Many students have difficulty setting up optimization problems so they correctly identify the objective function (the function you wish to optimize) and *all* constraints. You should take some time to familiarize yourself with the overall mathematical structure of these problems.
2. It is likely best to start with basic examples. I suggest working through the exercises from easier to harder problems.
3. Once you have set up the problem, be sure to emphasize how you are using the constraints. This includes *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, so you should be explicit in how you state and apply such a constraint. 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.
4. It is important to understand that 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 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 singular points and end points.