

MATH 104: Week 1 Learning Goals

Learning Goals

In the first week, we will review some material on exponential functions, logarithms, and inverse functions. This material should be familiar to the students from high school, though my experience is that they typically forget a lot of it. This material is found in Chapter 0, and in Appendix A. This is primarily a review of high school material. There is an expectation that students will review much of this material on their own. Please emphasize the natural exponential and logarithm functions as these are extremely important in this course. Note that we will revisit these functions in more detail later in the course, but it is good to have early exposure and multiple hits at this material.

We will also introduce some concepts from business: revenue, costs, and profit, and introduce the students to their first optimization problem. This problem motivates the need for the derivative. Before formally introducing the derivative (week 2), we cover the material of Chapter 1.1 to 1.5 to give the students an intuitive introduction to limits.

The specific learning goals for are that by the end of the week and review homework, you should be able to:

1. explain what an exponential function is. You should know the basic properties of exponential functions. You should be able to graph exponential functions. You should be able to solve basic equations, as per the exercises, involving exponential functions.
2. explain what a one-to-one function is and how to test for this property graphically using the Horizontal Line Test.
3. explain what an inverse function is. You should be able to determine the intervals on which a given function has an inverse (if they exist). Given the graph of function, you should be able to graph the inverse function, if it exists.
4. describe the logarithmic functions as inverse functions of the exponential functions. You should know the basic properties of logarithmic functions that parallel those of the exponential functions. You should be able to graph logarithmic functions. You should be able to solve basic equations using logarithmic functions.
5. explain revenue, costs, and profit for the case of linear demand. You should be able to set up and solve a simple problem involving maximizing revenue, for example, in this context. Note there are some posted notes on this material on the main Math 104 website..
6. give an intuitive explanation of the process of taking a *limit*. You should be able to compute the limits of functions similar to those presented in the examples in the notes.
7. compute the average rate of change of a function. You should be able to draw a diagram that illustrates this quantity.
8. draw a diagram to illustrate the process of computing an instantaneous rate of change of a function.
9. explain the relationship between finding average and instantaneous rates of change of a function and appropriate secant and tangent lines on graphs of this function.
10. explain *one-sided limits* and their relationship to two-sided limits. You should be able to examine these limits graphically and numerically.

Problems

We suggest you try some problems in Chapter 0 to review some of this basic high school material. Also, read through the extra notes on a basic business problem by Professor Mark Mac Lean posted on the webpage and do a selection of problems associated with Chapter 1.1 to 1.5, inclusive. Be sure to tackle some of the harder problems.