

Math 105 Week 1

January 4, 2011

1. LESSON PLAN

In this introductory week, we will review some old material on differentiation rules and derivatives of elementary functions such as polynomials, exponentials, logarithms, trigonometric and inverse trigonometric functions. In particular, you should remember how to apply the product rule, the quotient rule and the chain rule and how to differentiate a composition of the well-known elementary functions. This will also be a good opportunity to refresh your memory on some basic algebraic ingredients, such as trigonometric identities and rules for addition and multiplication of exponential and logarithmic functions, especially with different bases.

In terms of new material, we will introduce the notion of integration as an inverse operation of differentiation, and learn how to recast every derivation formula as an indefinite integral. As an example of this principle and as a first step towards compiling a toolkit for computing integrals, we will talk about the method of substitution.

2. LEARNING OBJECTIVES

The specific learning goals for this week is that by the end of the week and after going through the practice problems, you should be able to:

1. explain what an exponential and a logarithm function is. You should know the basic properties of exponential and logarithmic functions and their derivatives as presented in section 6.7. You should be comfortable sketching graphs of these functions. These functions are extremely important for this course, so it is good to have early exposure and multiple hits at this material.
2. describe the fundamental trigonometric and inverse trigonometric functions by drawing a right triangle. You should remember what the derivatives of \sin , \cos , \sec , \tan and their inverse functions are. Be comfortable drawing graphs of \sin , \cos and \tan functions.
3. understand what the words “anti-derivative” and “indefinite integral” mean, as explained in section 4.8. For instance, given an equation of the form $f' = g$, you should be able to write down the integral of g as $f + C$. Practise writing down equations involving differentiation, and then rewrite them in the language of integration, so that you understand the analytical relationship of these two operations.
4. understand the fundamental principle behind the method of substitution, namely the chain rule. This material is contained in section 5.5.
5. develop a sense for where the method of substitution is applicable, and how to come up with the right or most effective function to substitute. This will require a certain amount of practice, so start early.