

Math 105 Week 3

January 17, 2011

1. LESSON PLAN

This week we are going to tie up some loose ends in Chapter 5 (specifically in section 5.4) and launch into Chapter 7 (specifically sections 7.1 and 7.2).

Most of the important new material in Chapter 5 have already been covered in the first two weeks. However, there are a few rules of integration that we have not yet discussed that rely on *symmetry*; in other words, on some special structure of the integrand vis-a-vis the domain of integration. Though deceptively simple to state and to prove, these rules are powerful enough, in the appropriate context, to evaluate some otherwise impossible integrals. Our ode to symmetry will involve the discussion of *odd* and *even* functions and their integrals over an interval symmetric about zero.

We will also discuss the mean value theorem and its geometric interpretation in terms of the average value of the integrand.

Section 5.5 does not involve any new concepts. In our past visit to this section, we only discussed the parts of it that dealt with indefinite integrals. Now that we know how to evaluate a definite integral using the fundamental theorem of calculus, we will revisit this section with a view to solving the definite integral problems.

The primary goal for this week and the next is to compile a toolkit of integration techniques. The two that we will learn this week are “integration by parts” (section 7.1) and “trigonometric integrals” (section 7.2). Apart from knowing how to correctly apply these techniques, the challenge is also to identify the structure of the integrals where these techniques will be applicable.

2. LEARNING OBJECTIVES

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

1. be able to look for symmetry in an integral, and apply the rules of symmetry to your advantage when applicable.
2. know the statement of the mean-value theorem for integrals, and
3. be able to geometrically describe it.
4. know the principle of integration by parts, and
5. have a sense of the type of integral it can be successfully applied to.
6. same for trigonometric integrals.
7. know the formulae for integrals of $\tan x$, $\cot x$, $\sec x$ and $\csc x$, as given in Theorem 7.1 in the textbook.
8. be familiar with the notion of reduction formulae, especially in connection with integration by parts and/or trigonometric integrals, but there is no need to memorize the reduction formulae on page 463.