Review for Test 1

This test is over the material in Sections 5.1, 5.2, 5.3, 5.4, 5.5, and 6.1 of the text, which was covered in Assignments 1, 2, and 3. In addition to going over the homework problems from these assignments to make sure you understand how they were done, I'd recommend reading from the text following the outline below. It's also a good idea to try some extra problems from the text similar to those assigned, especially in section 5.5.

This may be a good place to comment on strategy for doing homework. When working problems, always make a sustained effort to do the problem by yourself. You'll find that sometimes you'll be able to do the problem yourself after being stuck for a while. But if you keep on being stuck and not making progress, go on to the next problem and get help later.

There are solutions manuals available for this text, but I recommend not getting one, or, if you have one, throwing it away — it's too difficult to resist the temptation to look into it at the first sign of difficulty. You may miss points by not handing in a correct problem that you struggled with, but I promise that you'll more than make up for them on the quizzes and tests with the increased understanding you gained in the process.

5.1 Areas and distances. You should read this section carefully to make sure you understand the meaning of, and the motivation for, the definition of definite integral in the next section. In particular, you should understand what Figures 8 and 9 on page 292 are getting at, and what the meaning is of the formulas for A at the bottom of page 294.

You can skip the computations in the solution of Example 2, although you should understand what the statement $\lim_{n\to\infty} R_n = 1/3$ means, and how it's related to figures 8 and 9.

You can also skip the material in the last pages of the section, titled "The Distance Problem".

5.2 The definite integral. You should re-read and be able to understand all the material in this section. I might ask you to give the definition of the definite integral (see the red box on page 300). You do not have to repeat it word for word, but your definition should explain the meanings of all the symbols used. See the definition I gave in class for a somewhat shorter version.

The properties of the integral listed in the red boxes on pages 307 and 308 are as important for what is NOT there as for what actually is there. Notice that there is no property concerning the integral of the product of two functions, $\int_a^b f(x)g(x)\,dx$!

5.3 The fundamental theorem of calculus. Be familiar with the statements of the Fundamental Theorem of Calculus, parts 1 (red box on page 315) and 2 (red box on page 318) and be able to use them to do problems as in examples 2, 4, 5, 6, and 7 in this section.

5.4 Indefinite integrals and the net change theorem Re-read pages 324-326, and make sure you know all the formulas in the red box on page 325. Again notice that there is no formula in this box concerning the integral of the product of two functions, $\int f(x)g(x)\,dx$. We did not cover the "Net Change Theorem" in class; you need not read the material on pages 327 to 329.

5.5 The substitution rule. This is one of the most important sections in the book, in the sense that you will need to use the substitution rule over and over again in this and future math and engineering courses. Read the entire section carefully. The final part, titled "Symmetry", on pages 337 to 338, is not absolutely necessary for the exam but the material it presents is often useful.

6.1 Areas between curves. This section is the first of several in Chapter 6 in which integrals are used to compute things other than the area under a curve. Read the entire section, except that you can skip Example 4 if you like. Try to pay particular attention to the explanation on page 347 leading up to the formula in the red box labelled 2. The goal of this section, and in fact all of chapter 6, is not to present a bunch of formulas to be memorized, but rather to explain the process of representing something (an area, a volume, work, ...) as a limit of Riemann sums, which can then be rewritten as an integral. You have mastered the subject of integration when you don't need to remember any formulas at all; but rather in any given situation, can figure out the correct integral on your own.

You might pause to look ahead to Chapter 9 at this point. Chapter 9 is not covered until Calculus III, but actually it contains exactly the same sort of examples as Chapter 6. Also, when you are taking Calculus III and get to chapter 9, you'll profit by looking back to Chapter 6.