Review for Third Exam

The third exam will cover sections 7.3, 7.4, 7.6, 7.8, 8.1, 8.2, and 8.3 of the text. I will not ask for definitions or proofs on this exam.

Here is a brief discussion of what material in the text is relevant to the exam:

7.3. We covered the entire section except for the change of base formula (formula 7 and example 7 on page 408), which you can skip. In particular, you should be able readily call to mind the graphs of e^x and $\ln x$ (see figure 3 on page 408); this contains information you might need to know about the limits of logarithmic and exponential functions. The discussion on page 409 of the behavior of the logarithmic function as $x \to \infty$ is worth reading carefully, as it provides you with some intuition about limits like the one in section 7.8.

7.4. We covered this whole section. I would recommend memorizing the formulas in red boxes in this section. Not all of them need to be memorized — you can derive some of them on your own if necessary — but they come up often enough and are useful enough that it's worth your while to memorize them.

Notice that this section covers the procedure called "logarithmic differentiation", which you should review to make sure you know how it works.

7.6. You should know this entire section. You should go over the proofs of the derivative formulas for the arcsine and arctangent functions (formulas 3 and 9 in red boxes). On the final exam, I might ask for one of these proofs. I won't ask for one on this exam, but it would help your understanding to know how to prove them anyway. You should also memorize the table of derivatives in the red box an page 459. Notice that once you have this table memorized, you automatically know the corresponding integration formulas, such as formulas 12 and 13 on page 460. It is crucial to have these memorized (and not have to spend brainpower and time trying to figure them out or guess at them) in order to be able to recognize which formulas to use in doing the integrals in Chapter 8.

7.8. We covered the material from the beginning of the section up through Example 7. Examples 6 and 7 are particularly interesting and worth your time to review. I will not ask questions like those in Example 8, 9, or 10, although those are quite interesting also, and reading through them is a good way to advance your understanding of exponential functions.

8.1. We covered the entire section. If you had trouble with the first question on Quiz 6, pay particular attention to Example 3.

8.2. As I mentioned in class, this section contains a rather long list of techniques to use in evaluating trigonometric integrals, and attempting to memorize them is not worth the effort. Instead, just learn the basic principles involved. There are only a few:

(1) for integrals involving powers of sine and cosine, try substituting $u = \sin x$ or $u = \cos x$, and after separating out du, use the identity $\sin^2 x + \cos^2 x = 1$ to express what's left as a simple function of u.

(2) if that doesn't work (that is, if you wind up with a function of u that's hard to integrate), try using the identities $\cos^2 x = \frac{1}{2}(1 + \cos 2x)$, $\sin^2 x = \frac{1}{2}(1 - \cos 2x0$, or $\cos x \sin x = \frac{1}{2} \sin 2x$ (I'll put these on the board during the test, but you should try to memorize them anyway).

(3) for integrals involving powers of secant and tangent, try substituting $u = \sec x$ or $u = \tan x$, and after separating out du, use the identity $\tan^2 x + 1 = \sec^2 x$ to express what's left as a simple function of u.

(4) if that doesn't work, try integration by parts (see example 8 in this section).

8.3. We covered the entire section, which deals with how to integrate functions which involve expressions of the form $\sqrt{ax^2 + bx + c}$. The most important thing to remember is the table of trigonometric substitutions on page 503. Once you make the right substitution, the integral should become a trigonometric integral, which you can then attack using the methods of section 8.2.

Note: some of the problems in this section involved completing the square (see example 7). Because of time constraints I won't ask a question on this exam where you have to complete the square. But you might take the opportunity to review this topic anyway, because it might turn up on the final exam.