Review for Final Exam

The final exam is comprehensive, covering the material in all the sections of the text from which problems were assigned — with the exceptions of sections 7.5 and 9.3. Thus the final covers sections 5.2, 5.3, 5.4, 5.5, 6.1, 6.2, 6.3, 6.4, 7.2, 7.3, 7.4, 7.6, 7.8, 8.1, 8.2, 8.3, 8.4, 8.8, 9.1, and 9.2.

You can refer to the review sheets for Exams 1, 2, and 3 to see which portions to review of the sections up through section 8.3. Notice, though, that I added a few problems from section 8.3 to assignment 12, and such problems might appear on the final (see below).

Like Exam 2, the final might include a question asking you to prove one or more of the following formulas: (i) $\frac{d}{dx}e^x = e^x$; (ii) $\frac{d}{dx}\ln x = \frac{1}{x}$; (iii) $\frac{d}{dx}\arcsin x = \frac{1}{\sqrt{1-x^2}}$; or (iv) $\frac{d}{dx}\arctan x = \frac{1}{1+x^2}$. See the review sheet for Exam 2 to brush up on these proofs.

This would also be a good time to make sure you have the basic differentiation and integration formulas memorized: see "List of Integrals" on the review sheet for Exam 3. Remember not to get derivatives and integrals mixed up! For example, the derivative of $\ln x$ is $\frac{1}{x}$, but the integral of $\ln x$ is more complicated (you can find it using integration by parts).

Here is a section-by-section guide to the material in the text that was not on the first three exams, but could appear on the final exam.

8.3. This section was already covered on the third exam, but there were also a few problems assigned in section 8.3 on assignment 12 (numbers 23, 24, and 35) that you might not have reviewed for the third exam, so you might go over them again now. They involve "completing the square"; an example is given in Example 7 on pp. 507–508. Completing the square is also occasionally useful when doing integration by partial fractions: see Example 6 on p. 515 in section 8.4.

8.4. You should review from the beginning of the section through Example 6, including the "Note" which appears at the bottom of p. 515 after Example 6. You can skip rest of the material in the section: I will not ask any questions in which the denominator contains a repeated irreducible quadratic factor, or problems which require a "rationalizing substitution". That is, you can skip Examples 7, 8, and 9.

8.5. I didn't assign any problems from this section, but you might get some benefit from glancing through it. It contains hints for deciding which method to use on a given integral. What these hints boil down to is: if algebraic simplification doesn't help, and there's no obvious simplifying substitution to make, then (i) if the function to be integrated is a quotient of polynomials, use partial fractions; (ii) if it contains the square root of a quadratic, use inverse trig substitution; and (iii) if it contains a mixture of algebraic (power) functions and transcendental (exponential, logarithmic, trig, or inverse trig) functions, try integration by parts.

8.8. Read from the beginning of the section through Example 8. You can skip the remainder of the section ("A comparison test for improper integrals").

9.1. You should remember formulas (3) and (4) for arc length in the boxes on pages 562 and 563. Also, read Examples 1 and 2 from this section. You can skip the rest of the section, except that reading the first paragraph at the top of p. 565, along with the accompanying diagram, might help you to remember the arc length formulas.

9.2. You can skip the first part of the section in which an integral formula for surface area of a solid of revolution is derived, and start reading from about halfway down the page on p. 570, where it says "Therefore, in the case where f is positive ... " through to the end of the section. As I was saying in class, there are two basic formulas in this section: the ones given in the red boxes numbered 7 and 8. The first is for a solid revolved around the x-axis and the second is for a solid revolved around the y-axis. The diagrams in

Figure 5 should help in keeping these formulas straight. In each of these two formulas, ds can be interpreted in two ways, as explained just below box 8; so each formula can be done either as an integral with respect to x or as an integral with respect to y.

9.3. There will be no material from section 9.3 on the final exam.