Topics for Exam 2
Math 31, Spring 2007

General information. Exam 2 will be a timed test of 70 minutes, covering 6.3–6.4, 7.1–7.2, 7.4, and 7.7–7.8 of the text, along with selected review topics. Most of the exam will be based on the homework assigned for those sections. If you can do all of that homework, and you know and understand all of the ideas behind it, you should be in good shape.

You are allowed to use a calculator and notes on **ONE** 3×5 note card (both sides).

As mentioned above, your first priority should be to understand the homework and quizzes and the ideas behind them. Besides the list of things you should know, below, you should also be familiar with everything specially emphasized in the text. If time permits, try to do some of the problems that have answers in the back of the book.

Review. Please review the applications in 5.5 (net change), 6.1 (difference of areas), and 6.2 (solids of revolution: discs and washers). There may be problems based on these applications, but requiring techniques of integration from Ch. 7. Also, you should understand THE METHOD (cut the problem into pieces, solve on each piece, add up the pieces in a definite integral).

Section 6.3. Volumes of surfaces of revolution through cylindrical shells. Basic setup (THE METHOD). Examples.

Section 6.4. Definition of work. Work against gravity. Metric vs. American units (mass vs. weight). Problem types: Raising chain, draining pool.

Section 7.1. Integration by parts: Basic formula, LIPET.

Gateway-ish skills. You should be able to do integrals quickly and precisely, using substitution or parts. Since you are allowed a notecard, basic formulas should include all of the usual suspects, such as $\int a^x \, dx$, $\int \frac{1}{1+x^2} \, dx$, $\int \frac{1}{\sqrt{1-x^2}} \, dx$, $\int \sec x \, dx$, $\int \sec x \tan x \, dx$, $\int \sec^2 x \, dx$.

Section 7.2. Trig identities: MOATI, $1 + \tan^2 = \sec^2 x$, double-angle formulas. $\int \sin^k x \cos^n x \, dx$, $\int \sec^k x \tan^n x \, dx$.

Section 7.4. Partial fractions: basic idea, form of decompositions. Solving for unknown coefficients. Review: factoring, long division of polynomials.

Section 7.7. Methods: left endpoint L_n, right endpoint R_n, midpoint M_n, trapezoidal T_n, Simpson's rule S_n. Pictorial comparison of errors (e.g., Fig. 5, p. 521).

Section 7.8. Improper integrals. Infinite limits of integration: definition, how to calculate, what convergent and divergent mean. Discontinuous integrands: definition, how to calculate, what convergent and divergent mean. Comparison test.

Not on exam. (6.4) Spring problems; physical constants (9.8 m/sec^2, etc.). (7.1) Cases like $e^x \sin x$ (Example 4). (7.4) Rationalizing substitutions. (7.7) Error estimates for approximation methods.