Final Exam Review

This exam covers sections 4.4, 4.9, 5.1-5.5, 6.1-6.5, 7.1, 7.4, 7.6-7.8, and 8.1-8.3 in your textbook. You should be able to do the following (associated textbook sections are listed in parentheses).

- Use l'Hospital's Rule to calculate an indeterminate limit. (4.4)
- Find general and specific antiderivatives of simple functions. (4.9)
- Approximate an integral using L_n, R_n, M_n, T_n, or S_n. (5.1, 5.2, 7.7)
- Evaluate a definite integral with your calculator.
- Evaluate a definite integral by applying the properties of integrals. (5.2)
- Find the derivative of a function of the form $g(x) = \int_a^x f(t)\,dt$ or $g(x) = \int_a^{h(x)} f(t)\,dt$. (5.3)
- Evaluate indefinite integrals using any of the following:
    - Basic integral facts and properties (5.4)
    - Substitution (5.5)
    - Integration by parts (7.1)
    - Partial fractions (7.4)
    - The table of integrals, possibly with a substitution (7.6)
- Evaluate definite integrals using the above and the FTC. (5.3 and all sections above)
- Use the net change theorem to find the total change in a quantity by calculating the integral of its rate of change, or create an integral that represents a requested total change. (5.4)
- Given a velocity function, calculate both distance traveled and displacement over an interval. (5.4)
- Calculate the area bounded by given curves. (6.1)
- Calculate the volume of a solid by slicing (this may include solids of revolution, or solid with a given base region and cross-sectional shape). (6.2)
- Calculate the volume of a solid using cylindrical shells. (6.3)
- Calculate the work required to lift an object, pump water, or stretch a spring. (6.4)
- Find the average value of a function over an interval, possibly to solve an application problem. (6.5)
- Evaluate improper integrals, or show that an improper integral is convergent or divergent through comparison. (7.8)
- Calculate the arc length of a function over an interval (most likely using a calculator for the actual integration). (8.1)
- Calculate the area of a surface of revolution (most likely using a calculator for the actual integration). (8.2)
- Calculate the hydrostatic force on a dam or an object submerged in water. (8.3)
- Determine the centroid of a lamina. (8.3)

Additional Information:

- You may use one side of a half-sheet of paper for notes.
- You will be given an abbreviated table of integrals. However, you should write any of the basic antiderivative facts from 5.4 that you don't yet have memorized on your note sheet.
- You will not be given any formulas that we use for a whole category of problems (e.g., work = force * distance, pressure = force / area, arc length formula, center of mass formula, etc.), so make sure those go on your note sheet as needed. But if a formula is specific to a problem (e.g., something has elliptical cross-sections so you need the formula for the area of an ellipse), it will be provided. I'll also provide the values to constant, such as the weight or density of water.

Please see the following practice problems from the Chapter Reviews, but you should also review your WebAssign homework! Some topics are not covered very thoroughly in the Chapter Reviews. If you did the review problems for the midterm, you'll recognize that some of them appear on this list too.

Practice Problems

Note: A pencil icon in your eBook indicates a video solution! I tried to mainly pick these. For the occasional even problem, the answers are below. Odd solutions are in Appendix I.

Chapter 4 Review (page 352): 9, 13, 65, 67
Chapter 5 Review (page 416): 1, 5, 9, 13, 15, 19, 23, 25, 33, 43, 45, 56, 57, 59
Chapter 6 Review (page 457): 1, 5, 7, 9, 15, 23, 25, 27, 28, 30
Chapter 7 Review (page 530): 7, 9, 11, 15, 17, 21, 25, 33, 35, 41, 47, 63
Chapter 8 Review (page 575): 1, 3, 9, 11, 13

Chapter 5 Review, #56:
a) 175/6 meters
b) 177/6 meters

Chapter 6 Review, #28: $\int_0^{30} 1600 + 10(200 - x)\, dx = 103{,}500$ ft-lbs

Chapter 6 Review, #30: $\frac{1}{10-0}\int_0^{10} t \sin(t^2)\, dt \approx 0.007$