Final Exam Review

This list is not comphrensive. You are expected to be able to answer any question using the tools that I have taught in class.

Note that the exams are no cumulative. Thus no material on items before those on this list will be explicitly tested.

The exam will be 6 free-response type questions. Partial credit will be given.

My advice to you is to do TONS of practice problems. It is the only way to study. There are so many integrals to practice at the end of chapter 6. You should be able to do EVERY one of them. Please see me if you're having any trouble. This test is very straightforward. If you know all the material below, you'll do well.

1. Know the fundamental theorem of calculus.

   Example: $\dfrac{d}{dx}\displaystyle\int_{-x^2}^{x^2} \cos(u^3)\sin(u^8)e^u\,du$

2. You must know how to take all sorts of integrals, and be able to identify which techniques to use.

   (a) Doing a u-substitution.
   Example: $\displaystyle\int \frac{x\,dx}{x^2+3}$
   Example: $\displaystyle\int x\sin(x^2)\,dx$
   Example: $\displaystyle\int \frac{\sin(\ln(y))}{y}\,dy$

   (b) Doing integration by parts.
   Example: $\displaystyle\int \left(x^3\cdot e^{x^2}\right)dx$
   Example: $\displaystyle\int (\arctan(x))\,dx$
   Example: $\displaystyle\int x\cdot\ln(x)\,dx$

   (c) Integrating Trig Functions.
   Example: $\displaystyle\int \sin^3(x)\cos^8(x)\,dx$
   Example: $\displaystyle\int \frac{\sec^6(x)}{\tan^3(x)}\,dx$
   Example: $\displaystyle\int \sec^5(t)\tan^3(t)\,dt$

   (d) Using trig-substitution.
   Example: $\displaystyle\int \sqrt{9-x^2}\,dx$
   Example: $\displaystyle\int \frac{1}{\sqrt{3x^2-2}}\,dx$

   (e) Using partial fractions
   Example: $\displaystyle\int \frac{x^2+1}{x^3+2x^2+x}\,dx$
   Example: $\displaystyle\int \frac{x^3}{x^2-3x-4}\,dx$
   Example: See problem 19 in chapter 6 review problems.

   (f) Doing integrals, and figuring out what to do (NOTE: On the test, I will never tell you what technique to do. I'll just give you an integral). For practice problems, check problems in the "Test Review" section of chapter 6

3. Know to to evaluate a definite integral

   Example: $\displaystyle\int_0^1 x\,e^x\,dx$

   Example: $\displaystyle\int_0^{1/2} \sin(\pi x)\cdot\cos(\pi x)\,dx$

4. Find the area between curves. For pratice problems, see section 7.1.
5. Find the volume of a solid over a region with a given cross section. See section 7.2 for practice.
6. Find the volume of a solid of revolution using the disk washer method. See section 7.2 for practice.
7. Find the volume of a solid of revolution using shells. See sections 7.3 for practice.
8. Knowing when to use shells or washers.