Midterm 2, Preview
MA 252, Calculus II, Midterm 2, Preview, Spring 2013

Things to keep in mind:

- The real exam will probably have only 6–8 problems.
- Practice doing these algebraically, without using your calculator.
- Practice variations on each problem.
- Memorize as many basic integral formulas as you can: this will make you faster and better at using them than if you had to look everything up in a sheet of notes.
- I will assume that the integrals from page 506 in the book (or Table 7.1 in section 7.5 from our online notes) have been memorized and/or copied to your note sheet and/or that you can find them from scratch very quickly.
- I will assume that if ∫ f(x) dx is one of our simplest anti-derivatives, then you can do the simplest u-substitution, ∫ f(ax+b) dx, almost immediately.
- This is a great test a little bit of flashcard work (to memorize the basic anti-derivatives, and maybe the integration strategy) and to do a lot of practice problems. Why not do 20 integrals from 7.5? Or look at the integral formulas on the back pages of the book, and see how many you can find on your own?
1. Find the following integrals (note: they are done in quite different ways)
   (a) \( \int \frac{1}{\sqrt{7 + x^2}} \, dx \)
   (b) \( \int \frac{x}{\sqrt{7 + x^2}} \, dx \)

2. Find \( \int 5x^3 \sqrt{10 + x^2} \, dx \)

3. Find the following integrals
   (a) \( \int \frac{1}{x^2 - 7} \, dx \)
   (b) \( \int \frac{1}{x^2 + 7} \, dx \)
   (c) \( \int \frac{x}{x^2 + 7} \, dx \)
   (d) \( \int \frac{x}{x^2 - 7} \, dx \)

4. Find the following integral
   \( \int \frac{x^6 + 2x^4 - 6x^2 + 10}{x^2 + 4} \, dx \)

5. Find the following integral
   \( \int \frac{1}{x^2 + 8x + 10} \, dx \)

6. Set up partial fractions for the following integral
   \( \int \frac{x^2 - 2x - 1}{(x - 1)^2(x^2 + 1)} \, dx \)

7. Find the following integral:
   \( \int \frac{x^2 - 2x - 1}{(x - 1)(x^2 + 1)} \, dx \)

8. Find the following integral (hint: do a \( u \)-substitution which turns it into a rational function)
   \( \int \frac{1}{e^{2x} + 3e^x + 2} \, dx \)

9. Find the following integral
   \( \int \sqrt{x^2 + 4x - 3} \, dx \)

10. Find the following integral
    \( \int e^{\sqrt{x}} \, dx \)

11. Find the following integral
    \( \int (3x + 2)e^{2x+1} \, dx \)

12. Find the following integrals, if they exist
    (Note: for these problems in particular, more than the correct answer is needed: it needs to be justified according to specific rules we have learned in class.)
    (a) \( \int_{-\infty}^{\infty} x^2 e^{-x^3} \, dx \)
    (b) \( \int_{0}^{1} \frac{1}{4x - 1} \, dx \)

13. (Stewart, 8.1#12) Find the arc-length of the following curve:
    \( y = \ln(\cos(x)), 0 \leq x \leq \pi/3 \)