Mathematics 134 – Intensive Calculus for Science 2
Exam 2 – Things To Know
March 15, 2002

General Information

As announced in the course syllabus, the second full-period midterm exam of the semester will be given in class on Friday, March 22. The format will be similar to that of the first midterm exam, and the midterms last semester. The exam will cover the material since the first exam (Quizzes 4,5,6), including the following material from Chapter 7, sections 2 and 3, and Chapter 8, sections 1,2,3. *Note: The material on numerical integration techniques from Chapter 7, sections 5 and 6 that we used in Lab 2 will not be covered on this exam, because we only used it via the computer.*

1) Integrals by parts: Selecting appropriate u and dv, computing du and v, using the parts formula $\int u\,dv = uv - \int v\,du$, then finishing the integral on the right. Recall that this might involve using parts again, or another method such as substitution.
2) Integrals by the table: Recognizing the appropriate entry, using reduction formulas repeatedly if necessary. Be aware that a preliminary substitution might be necessary to take an integral to one of the forms in the table.
3) Areas and volumes by integration – know how to set up an integral formula by slicing, approximating the area or volume of the slice, summing, then taking a limit to get an integral. You may need to use any one of the methods we know to evaluate one of these.
4) Important special case of 3 – volumes of solids of revolution. Know how to distinguish between the cases of disk or ring ("washer") cross-sections, and how to set up the integrals in each case.
5) Total mass and center of mass of an object of specified shape and given density function.

There will be a review for the exam in class on Thursday, March 21.

Sample Exam

I. Compute each of the integrals below using basic rules, substitution, or integration by parts. You must show all work for full credit. Just quoting an entry from the integral table will result in a deduction of 5 points per problem.

A) $\int x^2 e^{-2x}\,dx$

B) $\int x^3 \sin(x^2)\,dx$

C) $\int x \arctan(x)\,dx$

II. Compute each of the following integrals using an entry or entries from the table of integrals. Say which entry or entries you are using.

A) $\int \sqrt{x^2 - 9}\, dx$

B) $\int \cos^4(6x)\, dx$

III. *"Essay"* What are the "rules of thumb" we have used to select a good choice of u and dv in doing an integral by parts?

IV. Let R be the region bounded by $y = x^{3/2} + 1$, $y = 0$, $x = 0$ and $x = 4$.

A) Sketch the region.
B) Find the volume of the solid obtained if R is rotated about the x-axis.
C) Find the volume of the solid obtained if R is rotated about the line $y = -2$.

V. A thin metal plate has the shape of the region in the plane bounded by $y = \sin(x)$, $y = 0$, $x = \pi/4$, and $x = \pi/2$. The density of the material of the plate at all points x units from the left-hand edge is $\rho(x) = x$ grams per unit area.

A) Compute the total mass of the plate.
B) Set up (but do not evaluate) the integral to compute the x-coordinate of the center of mass.
C) Will the y-coordinate of the center of mass of this plate be on the x-axis? Why or why not?

Also see Problem Sets 4,5,6,7, the last three quizzes, and the Review Problems from the ends of Chapters 7,8 in the text for other practice problems.