Math 325, Spring 2001

Tips for Studying for the Midterm

The midterm is Wednesday, March 8. It will cover everything we have done so far, so Sections 4.1-4.4, 8.1, 8.3, 8.5, Chapter 7, and Sections 9.1-9.2 (up to *The Oscillating Pendulum* on p. 473) in Boyce and DiPrima and Chapters 5, 7, 8, and 12 of *Differential Equations with Maple.* You may bring a summary (one side of an $8\frac{1}{2}'' \times 11''$ sheet of paper, with notes in your writing) to the midterm.

Since you are allowed to bring in notes, I am not testing your ability to memorize formulas, algorithms, rules, etc. As you know by now, it is easy to get a computer to solve many ODE and systems of ODE, often explicitly, and almost always numerically. That means that the ability to do computations by hand is much less important. An understanding of the theory, an ability to tell whether computer output is reasonable, and the ability to interpret the output is very important.

What should you expect the exam to look like? It will have four problems, some with several parts, each worth 20-30 points.

At least two of the problems will involve computing solutions. What kind of problems have you learned how to compute solutions for this semester? Higher order constant coefficient linear equations and first order constant coefficient systems. I won't ask you to compute a numerical solution—that is best done by computer.

Since you have done a fair amount of work with Maple, I will want to test your ability to write simple Maple code. The simplest way for me to do that is to add a part to a computational problem which asks you to write Maple code to solve the problem (either explicitly or numerically), to plot the solution and/or to evaluate the solution at a specific time. This means that the problem will have to be an initial value problem. So, while you are reviewing how to solve such problems by hand, you might also want to try them with Maple.

You're probably thinking, "But when I do a Maple problem for homework, if my Maple code doesn't work, I can tell and correct it." Unfortunately, I have no way to let you do that during the exam, so I'll do the next best thing. The last sheet of the exam will be a bonus problem for you to remove from the rest of the exam, take with you, and turn in no later than the start of class on Friday, March 9. The problem will be to write down your solution

from the exam and try it on a computer to see if it works. If not, figure out what is wrong and correct it.

How can I test your ability to tell whether computer output is reasonable and if so, to interpret it? You have had some lengthy Maple problems from Problem Set C and Problem Set F. I will guarantee at least one problem (and at most two) in which you are shown a Maple worksheet which has the Maple input and output but no comments. The worksheet will have some relationship to one of the lengthy Maple problems. You will be asked various questions connected with the worksheet. How can you study for such problems? Make sure you understand how to answer *all* the questions you were asked on the Maple problems from Problem Sets C and F. If you were just shown the Maple input and output, would you be able to answer all the questions? Would you be able to tell what the point of the Maple worksheet was? You might look at the solution of #3 on Problem Set C at the back of the Maple book (without looking at the actual problem). Cover up all the explanations and just look at the input and output. See how much you can figure out about what the problem was and what information is contained in the Maple output. Now go back and look at the problem. Answer any questions you haven't already answered.

While some of the problems may require an understanding of theory, or be a lot easier if you do understand some theory, I won't test that understanding very directly. By that, I mean there will be no problems of the type that often cause you the most trouble in homework—none involving reading abstract mathematical statements or doing proofs.