

# Math53: Ordinary Differential Equations Autumn 2004

## Course Information

### Course Description

This is an introductory course in ordinary differential equations (ODEs). The primary focus will be on techniques for finding explicit solutions to linear ODEs. We will also study some nonlinear equations, elementary numerical methods, and ways of qualitatively describing solutions of ODEs without solving them explicitly.

### Prerequisites

Math 51 or equivalent is required for this course. In particular, you should be familiar with one-variable differentiation and integration, two-variable differentiation, vectors, matrices, systems of linear equations, determinants, and inverses, though some of this material is covered in Chapter 7 of the text and will be briefly reviewed in the course.

### Course Instructor

*Name:* Aleksey Zinger      *Office:* 380-383B (3rd floor of Building 380)      *Phone:* 723-1872  
*E-mail:* [azinger@math.stanford.edu](mailto:azinger@math.stanford.edu)      *Website:* <http://math.stanford.edu/~azinger/math53>  
*Office Hours:* Tues. 11-12 and Thurs. 10-11 in 383UU, Sun. 5-7 in 383N, and by appointment

*Note:* Please feel free to drop by my office, 383B, at other times as well.

### Course Time and Location

MTWRF 2:15-3:05 in Mudd Chemical Building, Rm 101, Braun Auditorium

### Course Assistants

<i>Name</i>	<i>Office</i>	<i>E-mail</i>	<i>Office Hours</i>
Ken Chan	380-380U1	<a href="mailto:kchan@math.stanford.edu">kchan@math.stanford.edu</a>	M 9-11am, Th 6-8pm, F 12 <sup>15</sup> -2 <sup>15</sup> pm
Ziyu Zhang	380-380T	<a href="mailto:zhangzy@stanford.edu">zhangzy@stanford.edu</a>	Tu 6-8pm, WF 8 <sup>45</sup> -10 <sup>45</sup> am

### Tutoring Help

The Stanford University Mathematics Organization (SUMO) provides a free tutoring service for students in the Math50s sequence. This tutoring service is available 6-10p.m. on Mondays and Wednesdays, starting on Monday, 10/4, in 380-381T, on the first floor of the math building.

## Exams

There will be two midterms and a final. The midterms will be held at the usual class time, 2:15-3:05p.m., on October 19 and November 16. The final exam will take place 7-10p.m. on Monday, December 6. The locations for the midterms and the final will be announced later in the term.

## Grading

*Problem Sets:* 15%

*Midterms:* 40%

*Final:* 45%

## Text

The book *Differential Equations* by Polking, Boggess, and Arnold, is required and is available at the bookstore in hardcover. A copy has been placed on reserve at the math library.

## Course Format

Math 53 classes are sometimes split into three lectures and two discussion sessions a week. There will be no such distinction between class meetings this quarter. Instead, most classes will be a mixture of lecture and discussion, and I hope more of the latter. So, please do speak up in class!

## Course Difficulty

Math 53 is typically a one-semester course, as is multivariable calculus, i.e. Math 51 and Math 52 *together*. This means that there is a lot more material to cover in Math 53 than in Math 51. As a result, the problem sets have to be longer than in Math 51. Thus, you will likely find this class to be more time-consuming, even though both classes are officially five units.

It is extremely important that you keep up with the course from the start. If you encounter any difficulty with anything in this class, *please* talk to somebody: me, the course assistants, SUMO tutors, or other students. The material covered before the first midterm will be fairly hard in my view. However, the middle portion of the course will be yet quite a bit harder, as it mixes in linear algebra and analytic geometry. By far the hardest part is the last unit, i.e. Chapter 10 of the book, as it is based on most of the rest of the course.

## Homework Assignments

There will be eight homework assignments. These will consist of a reading assignment and exercises for each class. The exercises listed on each homework assignment will constitute a problem set. Please try to do as much as possible of every daily assignment soon after the corresponding lecture. As the best way to learn the techniques covered in this class is to practice using them, you are encouraged to work through as many of the odd-numbered exercises in the textbook as possible. You will find answers to these problems in the textbook.

## **Problem Sets**

There will be eight problem sets, which will be due in class by 2:15p.m. on the due date. You can also hand your problem set to me any time, or day, before 2p.m. of the due date. Late problem sets will not be accepted.

You are encouraged to discuss any aspect of this class, including the material covered in lectures, the readings, and the problem sets, with anyone, including other students in the class and the SUMO tutors. You can also consult any source that may help you with the class in general and the problem sets in particular. However, you must write your own solutions to the problem sets.

Most (if not all) problem sets will contain a non-textbook problem (or two). These problems will be very different from the textbook exercises. If you do not know how to solve one of them right away, take a few minutes to analyze in detail what the question is. You are also encouraged to come to the office hours. The purpose of these additional problems is to relate the recently covered material to what you have learned previously, in this and other classes.

*Note:* Please complete a *substantial* portion of every problem set. Exercises are an integral part of this course.

## **Course Website**

The course website is <http://math.stanford.edu/~azinger/math53>. It will contain all handouts distributed in class and occasional announcements.

## **Miscellaneous**

Please do not hesitate to ask questions during lecture. I will also appreciate any comments and suggestions concerning the class, including any corrections to the handouts I distribute in class. Updated versions of any material handed out in class will be posted on the course website and marked as such.