Ordinary Differential Equations

MATH S3027Q (Summer 2011)

April 12, 2011

Instructor: Andre Carneiro
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Room 408 Math

Lectures: Mo/Tu/We/Th 4:30-6:05pm at 203 Math.

There is no class on Monday, July 4th and there is a make-up class on Friday, July 8th.


You are not required to own a copy of the textbook but be aware that it will be used as a source for homework problems. For some sections we will follow the text closely and for some others we might do things a bit differently.

Outline: We will cover the first 9 chapters of the book. The emphasis will be on ODE solving techniques but we will go over some qualitative and numerical methods as well, if time permits. We expect to achieve some understanding of the basic mathematical theory behind ODE’s, without proofs of the main theorems.

Prerequisites: The official prerequisite is Calculus III. You should be able to differentiate and integrate one-variable functions seamlessly and be familiar with partial derivatives. If you took Calculus a while ago, I’d recomend you go over some exercises before classes start. Knowing some linear algebra would be very helpful, but is not required - we will go over it as needed.

TA: TBA

Office Hours: TBA

Homework: Homework will be assigned on Tuesdays and Thursdays and due one week later, before class starts. You are encouraged to discuss the problem set with your classmates but you must write up solutions on your own. Late homework will not be accepted.
**Midterms:** We will have in-class midterms on Monday, July 18th and on Monday, August 1st (tentative).

**Final:** The final exam is scheduled by the University to be on the last day of classes, Thursday, August 11th. Take this into account when making travel or other arrangements.

**Grade:** The final grade will take into account the homework (15%), the midterms (35%) and the final (50%).

**Help Room:** You can go to Room 406 Math and ask any TA there for help with homework and general doubts. The help room schedule can be found in the Math department homepage.

**Schedule:** (tentative)

Week 1: Motivation and first definitions; Direction fields; General results about initial value problems; Linear, separable, autonomous and exact first-order equations. (Chapters 1 and 2)

Week 2: Second order linear equations with constant coefficients; Independent solutions and the Wronskian; Undetermined coefficients and variation of parameters; Remarks about higher order linear equations. (Chapters 3 and 4)

Week 3: Linear systems with constant coefficients; Eigenvalues, eigenvectors and Jordan’s normal form. (Chapter 7)

Week 4: Power series, Taylor series and analytic functions; Series solutions near ordinary points; Euler’s equations; Series solutions near regular singularities. (Chapter 5)

Week 5: Laplace transform; Step and impulse functions; Solution of linear equations with discontinuous forcing functions; Convolutions (Chapter 6)

Week 6: Numerical methods; Notions of stability. (Chapters 8 and 9)