Math 471
Introduction to Numerical Analysis
Winter 1997

1 Instructor

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2 Course materials

The textbook is *Introduction to Scientific Computation* by Charles Van Loan, Prentice-Hall 1997. Programming assignments are to be done in *Matlab*, an interactive system for numerical computation and graphical display. Matlab is available on the ITD and Math networks, and is also available in a moderately-priced student version (which comes with a very useful manual). The text is *Matlab* based and includes a lot of useful advice on using this system. *A Practical Introduction to Matlab* will be distributed and is available from my homepage.

3 Course description

This is a survey course on numerical analysis, the study of methods for obtaining, usually on a digital computer, approximate values of mathematically-defined quantities. In this course, we will cover the following topics: computer arithmetic, interpolation, numerical integration, solution of systems of linear equations, root-finding, and solutions of differential equations. This corresponds to the majority of the material in the text.

I will present both the derivation of the methods and the analysis of their errors. Errors (not to be confused with mistakes) are an inevitable part of using finite algorithms in finite-precision arithmetic, and a numerical method is not usually useful unless the errors can be controlled or at least estimated. For this reason, the course has a strong theoretical component.

At the same time, one of the goals of the course is to give the student experience with the practical performance of the algorithms. The problem sets will require both numerical computations and interpretation of results. Matlab is a very friendly environment in which to use the plug and play method for learning about the performance of numerical methods. The pitfalls of numerical methods are best appreciated this way.

4 Grades

Grades will be based on weekly problem sets and two exams, a midterm and a final. The homework will comprise about 55% of the grade with the midterm and final at 15% and 30% respectively. The grading will be about half on theoretical material and half on computational material. The homeworks will be more heavily computational and the exams more theoretical.