Preface

The lecture notes are taken from the course MCS 320: "Introduction to Symbolic Computation", which ran in the Spring and Fall of 2001, Spring 2003, Spring 2004 (in Spring 2005 by Anton Leykin), and now running again in Fall 2005. From a utilitarian point of view, the course introduces students to "canned" software. While a computer algebra system like Maple seems easy to use at first, we need a systematic and gradual introduction to the software to take advantage of its full power.

The topics treated in this course are modeled after the book of André Heck: "Introduction to Maple", Second Edition, Springer 1996. When the second edition went out of print, lecture notes were developed. While the notes are self-contained and sufficient for the course, there are many good reference guides to recommend:

Introducing Maple:

- Robert M. Corless: **Essential Maple 7. An introduction for Scientific Programmers.** Springer-Verlag, 2002.
- André Heck: **Introduction to Maple**. Third Edition, Springer-Verlag, 2003.
- M.B. Monagan, K.O. Geddes, K.M. Heal, G. Labahn, S.M. Vorkoetter: **Maple V Programming Guide.** Springer-Verlag, 1998.

Introducing MATLAB:

- Desmond J. Higham and Micholas J. Higham: **MATLAB Guide.** SIAM, 2000.
- Brian R. Hunt, Ronald L. Lipsman, and Jonathan M. Rosenberg: **A Guide to MATLAB, for beginners and experienced users.** Cambridge University Press, 2001.
- Andrew Knight: **Basics of MATLAB and beyond.** Chapman & Hall/CRC, 2000.

What are the goals in this course? We will try to achieve the following:

High level of Scientific Programming: Programming at the low level is hard, actually very hard, if one wants to develop software which solves practical problems efficiently and reliably. We see a Maple worksheet as a tool to develop a high level mathematical program.

Study of problems in Symbolic Computation: Just as numerical analysis is routinely taught, symbolic computation is an important subject area in its own right. While the research community is relatively small, the commercial success of packages like Maple and Mathematica stimulate a constant need for improvement. Faster computers always demand better software.

Integration of Symbolic and Numeric Tools: A practical application can seldomly be solved entirely by symbolic or numerical means. The symbolic approach usually requires too much of the available computer resources and a purely numerical solution is not always reliable enough.

That Maple and MATLAB are used in the course to achieve these goals is partially circumstantial (UIC has campus licenses for both programs), Mathematica could also serve for this purpose.

This material is based upon work supported by the National Science Foundation under Grant No. 0134611.

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