Preface to the Third Edition

The first two editions of this book have been very well received by the community, but so many revisions of the Maple system have occurred since then that simply reprinting the out-of-stock book would not do anymore. A major revision of the book was inevitable, too. The wording "major revision" must be taken seriously because I not only corrected typographical errors, rephrased text fragments, and updated many examples, but I also rewrote complete chapters and added new material. In particular, the chapter on differential equations now discusses Lie symmetry methods, partial differential equations, and numerical methods. Linear algebra is based throughout the book on the packages `LinearAlgebra` and `VectorCalculus`, which replace the deprecated package `linalg`. Maple users are strongly advised to do their work with the new packages. The chapter on simplification has been updated and expanded; it discusses the use of assumptions in more detail now. Last, but not least, a new chapter on Gröbner basis theory and the `Groebner` package in Maple has been added to the book. It includes many applications of Gröbner basis theory. Many of the Maple sessions have been rewritten so that they comply with the most recent version of Maple. As a result of all this work, hardly any section in the book has been left untouched.

From the Preface of the Second Edition

The first edition of this book has been very well received by the community. The new Version 4 of Maple V contains so many new mathematical features and improvements in the user interface that Waterloo Maple, Inc., markets it as "the Power Edition." These two facts have made it necessary to write a second edition within a short period of the first. I corrected typographical errors, rephrased text, updated and improved many examples, and added much new material. Hardly any chapter has been left untouched. Substantially changed or added sections and chapters address the assume facility, I/O, approximation theory, integration, composite data types, simplification, graphics, differential equations, and matrix algebra. Tables summarize features, command options, etc., and constitute a quick reference. The enlarged index of the book has been carefully compiled to make locating search items quick and easy. Many new examples have been included showing how to use Maple as a problem solver, how to assist the system during computations, and how to extend its built-in facilities.

From the Preface of the First Edition

In symbolic computation on computers, also known as *computer algebra*, keyboard and display replace the traditional pencil and paper in doing mathematical computations. Interactive computer programs, which are called *computer algebra systems*, allow their users to compute not only with numbers, but also with symbols, formulas, equations, and so on. Many mathematical computations such as differentiation, integration, series expansion of functions, and inversion of matrices with symbolic entries can be carried out quickly, with emphasis on exactness of results and without much human effort.

   Computer algebra systems are powerful tools for mathematicians, physicists, chemists, engineers, technicians, psychologists, sociologists—in short, for anybody who needs to do mathematical computations. Computer algebra systems are indispensable in modern pure and applied scientific research and education.

   This book is a gentle introduction to one of the modern computer algebra systems, viz., Maple. Primary emphasis is on learning what can be done with Maple and how it can be used to solve (applied) mathematical problems. To this end, the book contains many examples and exercises, both elementary and more sophisticated. They stimulate you to use Maple and encourage you to find your way through the system. My advice is to read this book in conjunction with the Maple system, try the examples, make variations of them, and try to solve the exercises.

In this book, emphasis is on understanding the basic principles and ideas of Maple so that you can use it effectively to solve your mathematical problems. Factual knowledge or information about every built-in Maple facility can be obtained from the on-line help system or from the Maple documentation that comes along with the software. This book does not teach mathematics; it is understood that you know the theory behind the examples. By choosing a variety of problems and showing how Maple can be used to solve them, you should get an idea of the capabilities of the system.

In this book, the usage of Maple as a programming language is not discussed at a higher level than that of defining simple procedures and using simple language constructs. However, the Maple data structures are discussed in great detail because good understanding of them is necessary for manipulating and simplifying expressions effectively. This also forms a good starting point to acquaint you further with Maple as a programming language.

About the Maple Version Used in the Third Edition

The third edition of this book is fully revised and updated to Maple 8. More precisely, the third edition of this book was produced with Maple 8 on a PC running Windows 2000, with a 1.7 Ghz Pentium 4 processor having 512 MB main memory. Maple 8 is available on many computer platforms, but most of the book should be system independent as it focuses on the mathematical contents of the system.

About the Production of the Third Edition

The manuscript has been typeset in LaTeX. The LaTeX code of the Maple sessions has been produced by exporting Maple worksheets with the sessions into this typesetting format. In this way, you can reliably reproduce the results on your computer screen and print on paper.

Source Code of Maple Sessions

Readers connected to the Internet can obtain the source code of all Maple sessions from the author's home page `www.science.uva.nl/~heck`

Notation

The following notation is used throughout the book: Maple keywords are in `typewriter font`, and references to Maple procedures are in **bold type**.

Acknowledgments

I am grateful to many people who have contributed to this book. My thanks go first to the developers of Maple. They have created a wonderful tool for scientists and engineers; Release 8 of Maple indeed allows you to command the brilliance of a thousand mathematicians, as commerce claims. Writing the new edition of the book has been an exciting tour through the new facilities. During the last years, Waterloo Maple, Inc., kindly provided me with updates of the Maple system so that I could keep abreast of developments in the software.

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I wish to thank all readers of the first two editions who sent me corrections of errors, helpful ideas, or expressions of appreciation. Their e-mail reports and letters have encouraged me to write this new edition.

Contact Address

Despite all the help I got, I am sure that users of this book will come up with remarks, suggestions, corrections, and so on. Please send them to

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