

Preface

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This book covers calculus in two and three variables. It is suitable for a one-semester course, normally known as “Vector Calculus”, “Multivariable Calculus”, or simply “Calculus III”. The prerequisites are the standard courses in single-variable calculus (a.k.a. Calculus I and II).

I have tried to be somewhat rigorous about proving results. But while it is important for students to see full-blown proofs - since that is how mathematics works - too much rigor and emphasis on proofs can impede the flow of learning for the vast majority of the audience at this level. If I were to rate the level of rigor in the book on a scale of 1 to 10, with 1 being completely informal and 10 being completely rigorous, I would rate it as a 5.

There are 420 exercises throughout the text, which in my experience are more than enough for a semester course in this subject. There are exercises at the end of each section, divided into three categories: A, B and C. The A exercises are mostly of a routine computational nature, the B exercises are slightly more involved, and the C exercises usually require some effort or insight to solve. A crude way of describing A, B and C would be “Easy”, “Moderate” and “Challenging”, respectively. However, many of the B exercises are easy and not all the C exercises are difficult.

There are a few exercises that require the student to write his or her own computer program to solve some numerical approximation problems (e.g. the Monte Carlo method for approximating multiple integrals, in Section 3.4). The code samples in the text are in the Java programming language, hopefully with enough comments so that the reader can figure out what is being done even without knowing Java. Those exercises do not mandate the use of Java, so students are free to implement the solutions using the language of their choice. While it would have been simple to use a scripting language like Python, and perhaps even easier with a functional programming language (such as Haskell or Scheme), Java was chosen due to its ubiquity, relatively clear syntax, and easy availability for multiple platforms.

Answers and hints to most odd-numbered and some even-numbered exercises are provided in Appendix A. Appendix B contains a proof of the right-hand rule for the cross product, which seems to have virtually disappeared from calculus texts over the last few decades. Appendix C contains a brief tutorial on Gnuplot for graphing functions of two variables.

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freely available to the public at no cost (go to <http://www.mecmath.net> (<http://www.mecmath.net>)). Feel free to contact me at mcorral@schoolcraft.edu for any questions on this or any other matter involving the book (e.g. comments, suggestions, corrections, etc). I welcome your input.

Finally, I would like to thank my students in Math 240 for being the guinea pigs for the initial draft of this book, and for finding the numerous errors and typos it contained.

January 2008 MICHAEL CORRAL