To the Reader
From the Author

This textbook reflects my personal views on how an introductory course in ordinary differential equations should be taught, tempered by such practical constraints as the time available, and the level and interests of the students. It also reflects my beliefs that a good text should be a useful resource beyond the course, and that it should back up its claims with solid and clear proofs (even if those proofs are ignored by most readers). Moreover, I hope, it reflects the fact that such a book should be written for those normally taking such a course; namely, students who are reasonably acquainted with the differentiation and integration of functions of one variable, but who might not yet be experts and may, on occasion, need to return to their elementary calculus texts for review. These students are reasonably intelligent, but are not mathematicians and may have no desire to be mathematicians. Still, most are interested in fields of study where a fundamental understanding of the mathematics and applications of differential equations is extremely useful. Some may have gone beyond the basic single-variable calculus and be acquainted with multivariable calculus. If so, great. They can delve into a few more topics. And those who've had a course in linear algebra or real analysis are even luckier. They can be on the lookout for points where the theory from those more advanced courses can be applied, and may even simplify some of the discussion.

If you are one of those students, then I hope you find this text readable and informative; after all, I wrote it for you. And if you are an instructor of some of those students, then I hope you find this text helpful as well. Just remember, I didn't write it for you, I wrote it for your students.

Whether you are a student, instructor, or just a casual reader, be warned: There is more material in this text than can reasonably be covered in a standard one-semester introductory course. There are expanded discussions of topics normally covered, as well as topics rarely covered but which are still elementary enough and potentially useful enough to merit discussion. And then there are the proofs that are not simple and illuminating enough to be included in the basic exposition, but should be there to keep the author honest. Because of this extra material, there is an appendix, *A Guide to Using This Text*, with advice on which sections must be covered, which are optional, and which are best avoided by the beginner.

By the way, this text is not complete. Additional chapters on the use of power series, systems of differential equations, and so on are being written. As they become written, they will become available at the author's website for this text, www.math.uah.edu/∼howell/DEtext/, along with any lists of known errors in the current edition.

It should also be noted that this, the 2012 edition, is basically the 2010 edition with some of the exposition cleaned up and/or expanded, a number of exercises added and/or modified, and the many, many reported typos corrected. Unfortunately, many more errors are surely lurking in these pages. If you find what you believe is a yet unreported error, please let me know using the contact information at the website mentioned above. Of course, you are also free to tell me exactly what you think of this text, good or bad.

And, finally, let me thank everyone who has already sent me their comments, suggestions, and typo reports. Your input has been invaluable, and I truly appreciate it.

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