Most sections end with a selection of exercises, the vast majority of which are of a computational rather than theoretical nature. In other words, the exercises generally begin with the word ‘solve’ rather than the word ‘prove’. An occasional exercise calls for the use of a computer algebra system.

A potential problem with using this book as a text for an introductory course in partial differential equations is that it omits some topics that might generally be considered standard fare for such a course. First order PDEs are not discussed, for example, and neither are characteristic curves. Also omitted is any discussion of numerical methods, or nonlinear theory. People teaching a course that is more narrowly focused on the ‘big three’ PDEs of mathematical physics might, however, want to take a look at this text. In addition, the level of detail and rigour found in the book might also make it quite suitable as a reference.

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Exploring mathematics: problem-solving and proof, by Daniel Greiser, pp. 320 (paper), £29.99, ISBN 978-3-319-90319-4, Springer Verlag (2018).

This book sets out to teach the reader to be a successful problem-solver and to be able to produce their own mathematical proofs. In a carefully designed and well-documented journey we are taken through a wide variety of problems and approaches to develop and improve our skills. The book sets out to expose us to three key themes: problems and problem-solving strategies, proofs, and some general ideas of mathematics. The author writes very clearly, making good use of footnotes to give extra information, and although I am the reader I can hear the author's voice very clearly. He explains very well and without dazzling us treats us to a very wide ranging set of problems and explanations.

The book is well-planned and reads like a series of very carefully thought through lessons. I enjoyed reading this and I could quickly find aspects I want to share with my classes. I really valued the section about proof by induction which I fear I've always struggled to teach well.

The first chapter reveals a few simple problems and shares some generally helpful problem-solving strategies. We then move through recursion, induction, graphs and counting before pausing to emphasise some of the strategies needed so far, and then on into logic, number theory and finally three principles: pigeonhole, extremal and invariance. There are exercises for the reader to complete, with hints and solutions. The problems are interesting and varied and quickly made me stop reading and think and want to solve them. Those problems I shared with classes have similarly extended and challenged the students to get started and to solve them. There is a very elegant simplicity to the problems and their solutions that reminds me how essential problem-solving skills are. The explanations use appropriate mathematical language; algebra is used wisely and efficiently and without being too showy or complex for the reader to follow.

This is a very clear and helpful book. It would be a useful addition to every teacher's repertoire and a very helpful source of interesting problems to share with students at all levels. I’m now very keen for my sixth form class to need to learn proof by induction, I’m sure this book will help me teach the topic in a much clearer and more engaging way than I have done before.

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