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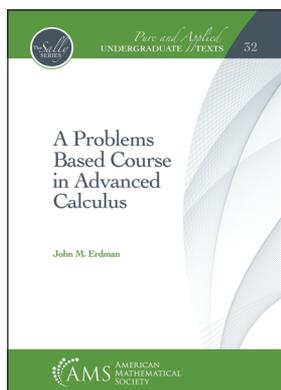
A Problems Based Course in Advanced Calculus
(AMSTEXT/32, 2018)
By John M. Erdman

As math courses in many colleges are transitioning to less lecturing and more interactive problem-driven formats, many instructors have gone away from traditional textbooks and have developed and honed their own course notes as they adapt their teaching methods to the needs of their students.

John Erdman's *A Problems Based Course in Advanced Calculus* is a successful example of the kind of book that can emerge from such a program. The book provides not only a useful list of problems, but also a compelling overall narrative, helpful words of guidance, and of course an emphasis on exercises.

The tone of the book reflects the author's years of experience balancing the need to give students helpful guidance while maintaining the principle that less teaching leads to more learning. All this culminates in prose that is conversational and inviting yet efficient and economical, allowing plenty of room for the reader to discover for themselves.

This book is aimed at students who have taken calculus and linear algebra but have little or no background in proof-writing. Using an appendix that introduces proof-writing basics, and three well-crafted narrative arcs, the author leads students from one-variable calculus with proofs, including notions like open and closed intervals and topological definitions of continuity and limits, to increasingly abstract notions including metric topology and normed linear spaces; and finally applies these ideas to multi-variable differential calculus.
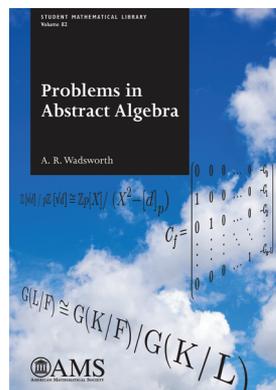
Problems in Abstract Algebra
(STML/82, 2018)
by A. R. Wadsworth

I have heard multiple calls, from students and instructors, for a massive database of exercises available on the web. But, as with collections of poetry, or paintings, there are clear advantages to a thoughtfully curated list. Wadsworth's book has the individual mark of a selection informed by the author's experience both as a mathematician who regularly applies the ideas and their offshoots in his research, and as a longtime teacher of the subject.

Problems in Abstract Algebra is self-contained, and runs through the usual topics of undergraduate (and beginning graduate) abstract algebra: group and rings, linear algebra, and Galois Theory. The main difference between this book and a standard textbook is that instead of complete proofs of standard results, the author only briefly sketches the ideas, and moves quickly from set up to exercises. In this way, students can actively experience for themselves the process of bringing the ideas to light.

For students, working through the exercises in this book is a great way to supplement an abstract algebra course. The book would also be ideal for a student preparing for graduate school, and wanting to review and test their knowledge. From the point of view of a teacher, the organization of topics provides a useful guide to pacing a course; and the selection of reliably good examples and exercises is a resource, not only for composing homework and examinations, but also for providing ideas for extra topics and commentary.

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