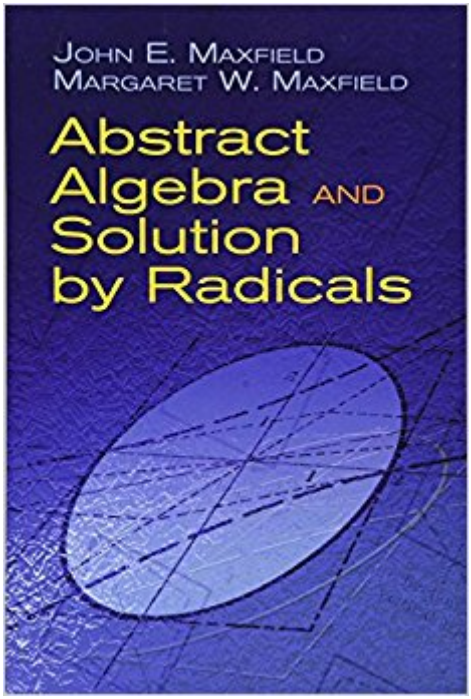
Abstract Algebra And Solution By Radicals (Dover Books On Mathematics)



Synopsis

This advanced undergraduate-level text was recommended for teacher education by The American Mathematical Monthly and praised as a "most readable book." An ideal introduction to groups and Galois theory, it provides students with an appreciation of abstraction and arbitrary postulational systems, ideas that are central to automation.The authors take the algebraic equation and the discovery of the insolubility of the quintic as their theme. Starting with treatments of groups, rings, fields, and polynomials, they advance to Galois theory, radicals and roots of unity, and solution by radicals. Thirteen appendixes supplement this volume, along with numerous examples, illustrations, commentaries, and exercises. Students who have completed a first-year college course in algebra or calculus will find it an accessible and well-written treatment.Ã Â

Book Information

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Customer Reviews

John E. Maxfield was the Dean of the Graduate School and University Research at Louisiana Tech University.Margaret W. Maxfield was a Professor of MathematicsÃ Â and Statistics atÃ Â Louisiana Technical University.

This book on abstract algebra is built around the notions of what used to be known as theory of equations. Mathematics students don’t study theory of equations much anymore, but abstract algebra and field theory are important to them. So many ideas from abstract algebra had their genesis in the solving of polynomial equations. This book follows the elementary idea of solving

polynomial equations over the field of rational numbers and the abstract algebra that developed to solve these general polynomial equations. The book culminates in the proof of the impossibility of solving polynomial equations of degree five or larger over the rational field in extensions of that field by roots (radicals). It is the young mathematicians lead up to the threshold of Galois Theory.

I taught out of the hardcover version of this book at SUNY College at Oneonta many moons ago. It was a course for first-semester sophomore mathematics majors. The goal of the book is to develop the subject matter that is needed to prove that the fifth degree polynomial is not solvable by radicals, i.e. there is no analogy to the Quadratic Formula for the quintic. (There is for the cubic and the quartic.) We had a good time because the course was focused on this one goal and the class knew exacly where we were headed. We got there, too. It was very easy to teach from this book and students rated it very highly. The students that I taught had Calculus I and II and a Foundations course as freshmen. The prior exposure to logic, sets and methods of proof (development of the integers) was very helpful, as was the maturity gained from the calculus (although the subject matter of Calculus was not necessary). I supplemented by rigorously developing the rational numbers, saving the reals for the Intro to Analysis course that followed this one. I am now a biostatistician outside of academia, but I hope that professors who are now teaching Abstract (Modern) Algebra will consider using this text in paperback form.

I cannot recommend this book to anyone that has not had substantial prior experience working permutation groups. The proof that A5 does not contain a proper normal subgroup is difficult to understand. Specifically, the proof investigates why A5 cannot contain a cycle of length 4. The simple answer is that any normal subgroup of A5 must contain only elements of A5 and elements of cycle length 4 are odd permutations and cannot be in A5 to begin with end of story! There’s nothing wrong with the proof in the text per se other than it is quite confusing if you are trying to get your head around what even and odd permutations are.That being said, the book does yield the subject matter under patience and protracted mental wrangling.

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This book tries to provide a short introduction to Galois Theory from basics, introducing groups, permutations, and field extensions along the way. I felt like the amount of material cut from the first half streamlined things greatly, but by the second half, they were cutting some major material. I was

most shocked that much of the groundwork for Galois Theory was relegated to several appendices at the back of the book. That makes the proofs in the latter half of the book more than informal -- they're incomplete. The missing elements get referenced in later proofs, which makes the exposition harder to follow since we're having a hand-wavey explanation asking us to remember the structure of another hand-wavey explanation.I also questioned the organization of the material. Besides putting so much material in the appendices, they also have questionable choices of problems. For example, in Chapter 9 on roots of unity, after several theorems about field extensions containing roots of unity, the first exercises are about proving that a subgroup of a cyclic group is cyclic and a group isomorphic to a cyclic group is cyclic. Why weren't these exercises included back in chapter 1? Diagrams would be rendered in awkward places, sometimes on the next page or in the middle of another page's text, even when there was room to include them next to the relevant text. Captions were poor for figuring out the relevant portion of text for the image.The writing style did not click with me either. I don't mind informality, but I felt these authors would take short, simple explanations and reiterate them in increasingly long and clunky formulations. It also wasn't always clear to me that this text was edited for standard English, because of phrases like "Has A_4 any subgroup of order 4?" (p 92) and "Which difficulties for Abel and Galois arose from communication lacks?" (p 101).The one part of the book I found enjoyable was the brief historical digression on the sad lives of Abel and Galois, because I learned more about their trajectories and Cauchy's incredibly irresponsible behavior.

This 200-page book is still the best introduction to group theory and to the Galois theory.The Maxfield duo have produced a superb and most comprehensive exposition of those difficult subjects, unequalled since.

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