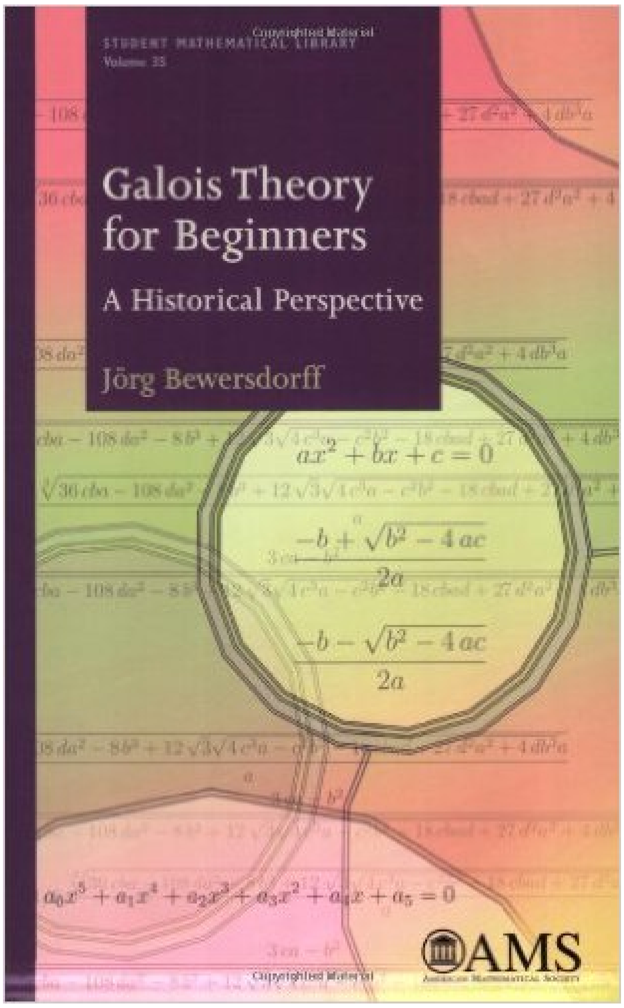
Galois Theory For Beginners: A Historical Perspective (Student Mathematical Library) (Student Matehmatical Library)



Synopsis

Galois theory is the culmination of a centuries-long search for a solution to the classical problem of solving algebraic equations by radicals. In this book, Bewersdorff follows the historical development of the theory, emphasizing concrete examples along the way. As a result, many mathematical abstractions are now seen as the natural consequence of particular investigations. Few prerequisites are needed beyond general college mathematics, since the necessary ideas and properties of groups and fields are provided as needed. Results in Galois theory are formulated first in a concrete, elementary way, then in the modern form. Each chapter begins with a simple question that gives the reader an idea of the nature and difficulty of what lies ahead. The applications of the theory to geometric constructions, including the ancient problems of squaring the circle, duplicating the cube, and trisecting an angle, and the construction of regular n-gons are also presented. This book is suitable for undergraduates and beginning graduate students.

Book Information

Series: Student Matehmatical Library (Book 35)
Paperback: 180 pages
Publisher: American Mathematical Society (September 5, 2006)
Language: English
ISBN-10: 0821838172
ISBN-13: 978-0821838174
Product Dimensions: 0.2 x 5.8 x 8.5 inches
Shipping Weight: 5.6 ounces (View shipping rates and policies)
Average Customer Review: 4.3 out of 5 starsÂ Â See all reviewsÂ (6 customer reviews)
Best Sellers Rank: #1,003,897 in Books (See Top 100 in Books)   #176 inÂ Books > Science & Math > Mathematics > Pure Mathematics > Algebra > Abstract   #884 inÂ Books > Science & Math > Mathematics > History   #2229 inÂ Books > Textbooks > Science & Mathematics > Mathematics > Algebra & Trigonometry

Customer Reviews

There are two ways to approach the teaching of a certain area of mathematics: the formal and one that emphasizes intuitive understanding with historical motivation. Formal works of mathematics are the majority, and in all of these one can see the full power of mathematical rigor and abstraction. But these are lacking in getting the reader to appreciate the subject, and it is very difficult to accept how the essential ideas were actually thought of. In the minority are those works that attempt to grant insight to the reader who craves for a more in-depth view of the mathematical concepts. These books are probably so rare because of the emphasis on rigor in mathematics and because they are much more difficult to write than formal texts and books. And it is insight that makes a great mathematician.This book on Galois theory is of the latter class, because of its emphasis on historical motivation and the many concrete examples given between its covers. The author has done a fine job of relating to the reader just how Galois theory arose and why its form as Galois discovered it, is very different than what one will find in modern books on the subject. Galois definitely was a "modern" mathematician in the sense that he emphasized studying mathematical objects according to the transformations they can support. This paradigm dominates contemporary pure mathematics, leaving applied mathematicians the worry of how to extract reality and numbers from highly esoteric constructions and theories.As the author explains brilliantly and originally, it was the desire to find solutions of higher degree polynomials in terms of radicals that motivated Abel and Galois to investigate to what extent this is possible.

This is a very interesting and entertaining book. It allows the student of Galois Theory to ’look under the hood’: the modern day presentation of that theory is essentially Emil Artin’s streamlined field theory approach, which is a beautiful theory, but many students would appreciate more detail about how mathematicians went from solving polynomial equations to analyzing field extensions.The book goes a good way toward filling this gap. By providing appropriately chosen concrete examples, the author leads the reader to a deeper understanding of the nuts and bolts underlying Galois Theory (and to some pretty lengthy -- but worthwhile -- computations -- by working the exercises at the end of each chapter). The book also reveals how mathematical ideas evolve and how close Lagrange and Ruffini came to the (still revolutionary) ideas of Galois. The author keeps prerequisites at a minimum, but he does make demands upon the ’beginner’. The more advanced asides are appropriately placed throughout the book and can be skipped without consequence (the reader will want to return to them on a second reading, though). The book begins with the historical methods used both to solve cubic and quartic polynomial equations as well as to reduce and solve special polynomial equations of higher degree. The book culminates in Galois’s original ’elementary’ view of what is now called the Galois group of the solutions of a polynomial equation, followed by the correspondence between the ’decomposition’ of a such a group into its subgroups and the present day field extensions (after a minimal introduction to groups and fields). In addition to the historical detail, there are many asides of further explanation or further computational techniques as well as references to the literature.

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