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Algorithmic methods. Numbers, vectors, polynomials. (Algorithmische Methoden. Zahlen, Vektoren, Polynome.)

Mathematik Kompakt. Basel: Birkhäuser (ISBN 978-3-7643-8434-0/pbk). xii, 160 p. (2009).

Algorithmic methods are useful tools for solving technical, scientific, or industrial problems. Typically, the problem at hand is specified as a mathematical problem and a suitable algorithm for solving it is desired. The algorithm is then often expressed and executed as a computer program with appropriate data representations and program-using techniques. The algorithmic method for solving problems requires expertise in several areas such as numerical methods or computer algorithms and efficient programming. This book for students in their first or second year presents the basic knowledge necessary for applying the methods to different problems. The first chapter nicely presents many basic concepts for problem solving with algorithms, such as specification, iterative algorithms, rounding errors, discretization, recursion, norms, stability, or complexity. The next three chapters cover concepts and algorithms for numbers, vectors, or univariate polynomials, respectively. A second volume will cover functions, matrices, and multivariate polynomials, respectively. The presentation of these chapters also includes relevant concepts from analysis, linear algebra, numerical analysis, algorithm design, programming, and other aspects of computer science. For algorithms, a pseudocode as well as the implementation for a computer is discussed, often separated into computer representations of the aspects and programming techniques. The presentation is given in mathematical rigorous style and no further reading seems to be required to read the text or design a course. The book is written in German. The underlying course was designed for students of technical mathematics, but is as well suited for computer science students in the area of scientific computing. *Thomas Rauber (Bayreuth)*

Classification: N35 N45 U25

Keywords: algorithms; numerical linear algebra; numerical analysis; computer algebra