

ZMATH 2001f.05478

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Numerical mathematics 1. (Numerische Mathematik 1.)

Springer, Berlin (ISBN 3-540-67878-6). 381 p. (2002).

Numerische Mathematik ist ein zentrales Gebiet der Mathematik, das fuer vielfaeltige Anwendungen die Grundlage bildet und das alle Studierenden der Mathematik, Ingenieurwissenschaften, Informatik und Physik kennenlernen. Das vorliegende Lehrbuch ist eine sorgfaeltig ausgearbeitete Einfuehrung fuer Anfaenger. Teil I stellt das Grundwissen zusammen, wiederholt die Grundlagen der linearen Algebra und fuehrt die allgemeinen Konzepte von Konsistenz, Stabilitaet und Konvergenz ein. Teil II behandelt die numerische lineare Algebra mit der Loesung linearer Systeme und der Eigenwert- und Vektorberechnung. Teil III behandelt nichtlineare Gleichungen, nichtlineare Systeme und Optimierungsprobleme.

This textbook in numerical mathematics is primarily addressed to undergraduate students in mathematics, physics, computer science and engineering. Well known methods as well as very new algorithms are given. The methods and their performances are demonstrated by illustrative examples and computer examples. Exercises shall help the reader to understand the theory and to apply it. MATLAB-software satisfies the need of user-friendliness. "The spread of numerical software presents an enrichment for the scientific community. However, the user has to make the correct choice of the method which best suits at hand. As a matter of fact, no black-box methods or algorithms exist that can effectively and accurately solve all kinds of problems." All MATLAB-programs are available by internet. The content of the textbook is organized into four parts and 13 chapters. In Part I the authors review basic linear algebra and introduce to consistency, stability and convergence of numerical methods and they explain basic elements of computer arithmetic. Part II is about numerical linear algebra, and it is devoted to the numerical solution of linear systems, eigenvalue and eigenvectors computation, results on sparse matrices are given. Part III deals with rootfinding for nonlinear equations, nonlinear systems and numerical optimization, polynomial interpolation including approximation by splines, numerical integration including singular integrals and multidimensional numerical integration. ration and transforms b

Classification: N35