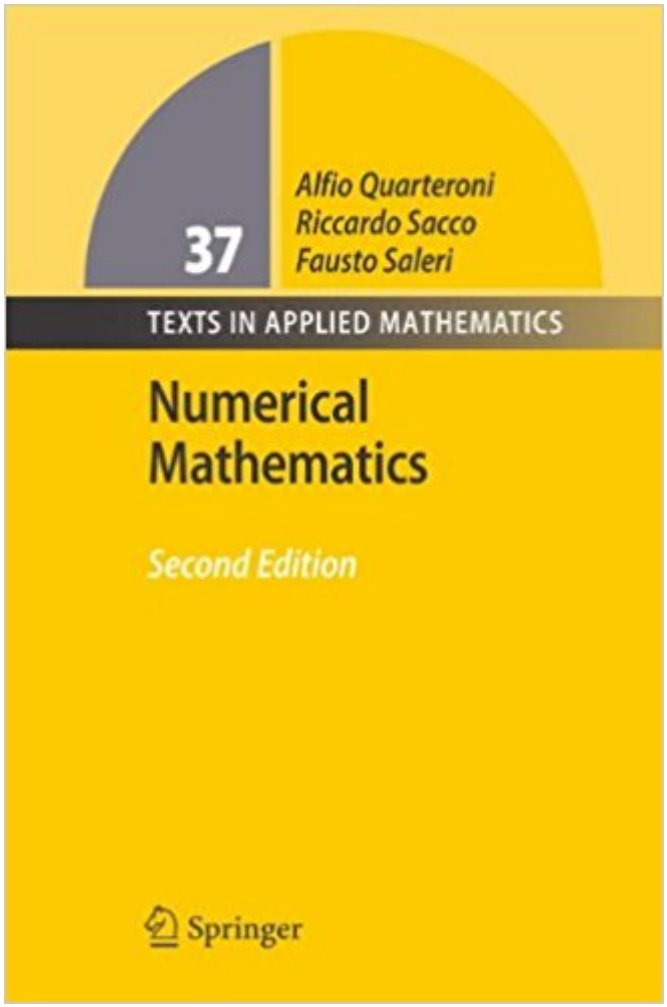
Numerical Mathematics (Texts In Applied Mathematics)



Synopsis

This book provides the mathematical foundations of numerical methods and demonstrates their performance on examples, exercises and real-life applications. This is done using the MATLAB software environment, which allows an easy implementation and testing of the algorithms for any specific class of problems. The book is addressed to students in Engineering, Mathematics, Physics and Computer Sciences. In the second edition of this extremely popular textbook on numerical analysis, the readability of pictures, tables and program headings has been improved. Several changes in the chapters on iterative methods and on polynomial approximation have also been

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Customer Reviews

From the reviews of the first edition: SIAM REVIEW "I found many of the examples to be quite interesting. I find no fault with any of the theoretical portions of the text. The authors are quite thorough in their discussion of the theory underlying each of the topicsâ |This text uses MATLAB for programming the numerical codes. This is a very good choiceâ |It contains a lot of interesting and useful information for experienced users of numerical methodsâ |" ZENTRALBLATT MATH "This is an excellent and modern textbook in numerical mathematics! It is primarily addressed to undergraduate students in mathematics, physics, computer science and engineering. But you will need a weekly 4 hour lecture for 3 terms lecture to teach all topics treated in this book! 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. he 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. ... There are a lot of numerical examples and impressing figures and very useful applications, as for instance: Regularization of a triangular grid, analysis of an electric network and of a nonlinear electrical circuit, finite difference analysis of beam bending, analysis of the buckling of a beam, free dynamic vibration of a bridge, analysis of the state equation for a real gas, solution of a nonlinear system arising from semiconductor device simulation, finite element analysis of a clamped beam, geometric reconstruction based on computer tomographies, computation of the wind action on a sailboat mast, numerical solution of blackbody radiation, compliance of arterial walls, lubrication of a slider, heat conduction in a bar, a hyperbolic model for blood flow interaction with arterial walls. It is a joy to read the book, it is carefully written and well printed. ..... In the reviewers opinion, the presented book is the best textbook in numerical mathematics edited in the last ten years."W.H.Schmidt, Zentralblatt fÃ r Mathematik 991.38387

Â Numerical mathematics is the branch of mathematics that proposes, develops, analyzes and applies methods from scientific computing to several fields including analysis, linear algebra, geometry, approximation theory, functional equations, optimization and differential equations. Other disciplines, such as physics, the natural and biological sciences, engineering, and economics and the financial sciences frequently give rise to problems that need scientific computing for their solutions. As such, numerical mathematics is the crossroad of several disciplines of great relevance in modern applied sciences, and can become a crucial tool for their qualitative and quantitative analysis. One of the purposes of this book is to provide the mathematical foundations of numerical methods, to analyze their basic theoretical properties (stability, accuracy, computational complexity) and demonstrate their performance on examples and counterexamples which outline their pros and cons. This is done using the MATLABTM software environment which is user-friendly and widely adopted. Within any specific class of problems, the most appropriate scientific computing algorithms are reviewed, their theoretical analyses are carried out and the expected results are verified on a MATLABTM computer implementation. Every chapter is supplied with examples, exercises and applications of the discussed theory to the solution of real-life problems. This book is addressed to senior undergraduate and graduate students with particular focus on degree courses in engineering, mathematics, physics and computer sciences. The attention which is paid to the applications and

the related development of software makes it valuable also for researchers and users of scientific computing in a large variety of professional fields. In this second edition, the readability of pictures, tables and program headings has been improved. Several changes in the chapters on iterative methods and on polynomial approximation have also been added. From the reviews of the first edition: "This is an excellent and modern textbook in numerical mathematics! It is primarily addressed to undergraduate students in mathematics, physics, computer science and engineering. But you will need a weekly 4 hour lecture for 3 terms lecture to teach all topics treated in this book! 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. [....] In the reviewers opinion, the presented book is the best textbook in numerical mathematics edited in the last ten years." Zentralblatt fÃ r Mathematik 2001, 991.38387

A hefty tome of numerical mathematical knowledge. Rather like religious text in some sense: comprehensive and final, but difficult notation makes it hard to decipher the meaning in places.

Definitely a classic. Loads of useful information.

Every page of this book is written like an extended mathematical proof. It can be daunting if you’re not accustomed to this type of text.

Reference book rather than a textbook. But a good reference book.

The book satisfied the purpose and I couldnt have asked for anything else. It was the right edition and good quality.

I’ve been using this book in an intro to numerical math course at the graduate level. It is the only textbook for the course, and it leaves some to be desired. A number of the sections are very clear and well-written, and it makes understanding the material a breeze. However, there are as many sections that seem to have been thrown together and only provide a cursory glance at the ideas involved, but lack examples and implementations. Those sections sometimes lack enough information to "fill in the gaps" as would be expected at the graduate level, so after reading it, the reader is left with a hazy "30,000 foot view" of the solution and very little else to grab on to. The

notation is sometimes confusing and undefined. There is a particular example on splines that uses non-standard notation for characteristic functions, which left everyone in the course confused about what was even being asked. It also uses some strange methods in the Matlab code that require some tweaking if you aren't careful. They were certainly written in a FORTRAN style. So I have a split opinion of this book. When its good, its really good, but when it misses the mark, it really misses the mark. So I give it 5 stars for when it works, and 1 for when it doesn't, so my net score is 3 stars.

This is one of the least effective textbooks I've ever used. The book is full of typos, bad notation, and terms not seen anywhere but this text. Some of the given Matlab code doesn't work, and many of the exercise problems are written confusingly with nonsense answers. This book is a translation, so some typos and unclear exposition are expected. By the second edition, however, one would expect a better result. I don't recommend this book, even as a reference.

I have used this book as a reference for some basic theoretical material, and find it to be carefully formulated, at about the level of a junior or senior undergraduate who has a good math background. I also found the author's comments to be perceptive and helpful. I recommend the book as a reference, but think that this might not be a very suitable text for a course in numerical methods at the undergraduate level, due to its sophistication.I consulted the book for some of the theory related to numerical analysis of ordinary differential equations. This is the topic of Chapter 11. Proofs are presented in a manner suitable to undergraduates, leaving out material that is perhaps important for a graduate student (I found myself writing out my own proofs for the main results) but somewhat peripheral for an undergraduate. Even so, the coverage in the book is wide-ranging, and would be satisfactory for a good introductory graduate-level course in numerical analysis.The version of the text I was reading was the second edition, and of course with three authors, and a presentation that is fairly abstract and condensed, one realizes that there will be certain limitations. Personally, I find that I learn best when there is not only a clear presentation of material, but when there is substantial reviewing from each section to the next, when numerous, high-quality visual aids are employed, when there is some "down time", during which the discussion lightens up a bit, and also when context is made clear and a perspective is provided. In a deep reference like this one, where there is a bit of a scatter due to multiple authors and the fact that one is not dealing with a first edition, one must achieve these desirable goals on one's own, and supply, for example, the needed perspectives. This can, to put it mildly, be hard work. I am quite tolerant of that (and one actually

expects it in much that is worthwhile), and of ambiguities, arising, for example, from differences in style of different authors. On the other hand, with a difficult and important book such as this, one finds that one can only dedicate limited time: Every moment can be precious. Therefore, I think that it is optimal to come to a book like this with some definite plan of which parts of the book one wants to study, and the particular context of the study. However, I do recommend this book as a reference, despite some notable deficiencies.As a final comment on this book, I believe that there was an over-reliance on one particular (and somewhat dated) reference in the writing of the chapter that I read (Chap. 11 on numerical methods of ODEs), with the result that, while for the original reference (which was a book specializing in numerical analysis of ODEs) the organization was satisfactory, in a short chapter, as occurs in this book, that organization did not work very well.

Volume 1: Classical Results and Geometric Methods (Applied and Numerical Harmonic Analysis) Stochastic Models, Information Theory, and Lie Groups, Volume 2: Analytic Methods and Modern Applications (Applied and Numerical Harmonic Analysis)