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(PLEASE TYPE REVIEW DOUBLE-SPACED)

CATEGORIES SUGGESTED BY REVIEWER:

This is a welcome translation of the Swedish Edition which first appeared in 1962.

The text, which is on the Junior-Senior level, is aimed at students who have had only calculus and differential equations. The parts of matrix theory which are required are covered in the book.

The book is readable and the selection of material stresses the recent literature. Witty and appropriate selections from various literary sources head the various chapters.

The initial chapter discusses the representation of numbers, errors and the computation of functions including a section on the computation of functions using binary representation.

The second chapter deals with nonlinear equations, discussing Newton-Raphson, Bairstow, Graeffe, and QD methods. A table on page 36 compares the number of function and derivative values required per iteration with the order attained by certain methods. Thus Newton-Raphson is listed as requiring one function value and one derivative value whereas ^rRegula falsi is listed as requiring two function values. This comparison is not valid since only one new function value is computed in ^rRegula falsi while the other function value is available from the previous iteration.

Chapter 3 contains a fairly thorough introduction to those parts of matrix theory of most importance in numerical analysis. Included is material on Gershgorin circles, matrix functions, and matrix norms. This material is used in the following three chapters to analyze the solution of linear systems, matrix inversion, and the algebraic eigenvalue problem. The chapter on linear systems features a backward error analysis ala Wilkinson, while the chapter on eigenvalues gives fairly thorough analyses of the methods of Jacobi, ⁿLaxcos, Givens, and Householder.

Chapter 7 introduces the operators of the calculus of finite differences and these operators are used in the following five chapters to deal with interpolation, numerical differentiation, numerical quadrature, summation, and briefly, multiple numerical quadrature.

Chapter 13 introduces difference equations and these are used in the following two chapters to treat the numerical solution of ordinary and partial differential equations. For ordinary differential equations the methods discussed include those of Clenshaw, Runge-Ku^tta, Milne, and Numerov. (Of the predictor-corrector methods only Milne's is mentioned.) Sturm-Liouville's problem is discussed. The chapter on partial differential equations introduces the classification scheme for partial differential equations and considers simple examples of each type. There is a confusing section on stability. Stability is defined in terms of convergence of solution of difference equations to the solution of differential equations. However the numerical example in this section illustrates the damping out of an initial error. There is no comment on the connection between these two ideas of stability.

Chapter 16 discusses approximation using least square polynomial approximation, least square trigonometric approximation, and approximation by exponential functions, Cheb^yshev series and continued fractions. Approximation in the sense of Cheb^yshev is mentioned only on the last page of the chapter and is limited to examples exhibiting a number of rational Cheb^yshev approximations.

Chapter 17 on Monte Carlo methods opens with a discussion of random number generators. Examples of Monte Carlo methods are drawn from the solution of Laplace's equation and the computation of definite integrals. The book ends with a formulation of linear programming problems and a description of the simplex method.

Professor Froberg's book is a welcome addition to the available introductory texts in numerical analysis.

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