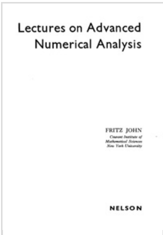
Lectures on Advanced Numerical Analysis

06.10.2007

Автор(ы): Fritz John
Год изд.: 1966

Описание: A large number of mathematical books begin as lecture notes; but, since mathematicians are busy, and since the labor required to bring lecture notes up to the level of perfection which authors and the public demand of formally published books is very considerable, it follows that an even larger number of lecture notes make the transition to book form only after great delay or not at all. The present lecture note series aims to fill the resulting gap. It will consist of reprinted lecture notes, edited at least to a satisfactory level of completeness and intelligibility, though not necessarily to the perfection which is expected of a book. In addition to lecture notes, the series will include volumes of collected reprints of journal articles as current developments indicate, and mixed volumes including both notes and reprints.

Оглавление:



Chapter 1. MATRIX INVERSION
1. Systems of Linear Equations in Matrix Notation [1]
2. Norms of Vectors [2]
3. Norm of a Matrix [5]
4. Special Natural Norms for Matrices [11]
5. Estimate of the Error due to Approximating the Equations [13]
6. Estimates for the Norm of the Reciprocal of a Matrix [14]
7. Matrix Inversion by Successive Approximations [16]
8. Effect of Rounding off [18]
9. Solution of Systems of Linear Equations by Successive Approximations [18]
10. Successive Approximations Using a Partial Inverse of the Matrix [19]
11. Accelerated Iteration Schemes [22]
12. Gradient Methods [24]
13. Solution by Expansion in an Orthogonal System [27]
14. Hestenes-Stiefel Conjugate Gradient Method [29]
15. The Elimination Method [32]
Chapter 2. SOLUTIONS OF NON-LINEAR EQUATIONS AND SYSTEMS OF EQUATIONS
1. Number of Real Zeros of a Polynomial in an Interval [36]
2. Number of Complex Zeros of an Analytic Function inside a Curve [38]
3. Common Roots of Two Real Functions of Two Real Variables [39]
4. Number of Common Zeros of Two Real Polynomials of x, y inside a Polygon [44]
5. Zeros of a Polynomial in the Complex Half-Plane [45]
6. Bernoulli's Method for Finding the Largest Root of an Equation [46]
7. Finding the Second Largest Root [50]
8. Determination of the Smallest Root of an Analytic Function [52]
9. Graeffe Root-Squaring Process [53]
10. Roots as Limits of Rational Expressions. Lehmer Method [56]
11. Graeffe Process Applied to Eigenvalues of Matrices and Zeros of Analytic Functions [58]
12. Iteration Schemes for Solving Systems of Equations [60]
13. Newton's Method for Scalar Equations [67]
Chapter 3. APPROXIMATION OF EIGENVALUES OF A MATRIX

1. Isolating the Eigenvalues [70]
2. Use of Rotations [73]
3. Iteration Schemes for Eigenvalues [75]
Chapter 4. APPROXIMATION OF FUNCTIONS
1. Lagrange Interpolation Formula [79]
2. Newton's Interpolation Formula [81]
3. Representation and Estimate for the Remainder Term [83]
4. Limitations on the Use of Interpolation Polynomials as Approximations [86]
5. Sufficient Conditions for Convergence of Interpolation Polynomials. Numerical Analytic Continuation [87]
6. Interpolation and Continuation Based on Approximate Data [89]
7. Trigonometric Interpolation [91]
Chapter 5. SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS
1. The Euler Polygon Method [94]
2. Refined Difference Schemes [97]
3. Convergence of Difference Approximations [98]
Chapter 6. THE HEAT EQUATION
1. The Appropriate Problems [106]
2. Exact Solution of the Heat Equation, Initial Value Problem [107]
3. Difference Approximations [108]
4. Error Estimate. Stability Condition [110]
5. Divergence in the Unstable Case [112]
6. Acceleration Schemes [113]
7. Relaxation of the Regularity Assumptions [115]
8. Probabilistic Interpretation of the Difference Scheme [116]
9. Asymptotic Expansion of the Fundamental Solution of the Difference Scheme by the Method of Stationary Phase [117]
10. Convergence of the Difference Scheme for Riemann Integrable and Bounded Data [120]
11. The Mixed Initial-Boundary-Value Problem [121]
12. An Implicit Scheme for the Heat Equation [124]
13. Method of Solution of the Difference Equation for the Implicit Scheme [127]
Chapter 7. THE WAVE EQUATION
1. Analytic Solution. The Simplest Difference Scheme [129]
2. Exponential Solution of the Difference Equation [131]
3. Convergence Proof by Fourier Transformation [131]
4. Convergence in the Unstable Case for Analytic Data [134]
5. (?)-Estimates for the Solution of the Difference Scheme [135]
6. Estimates of Accumulated Round Off Error [136]
Chapter 8. FRIEDRICH'S METHOD FOR SYMMETRIC HYPERBOLIC SYSTEMS
1. Example of the One-Dimensional Wave Equation [138]
2. The General Symmetric Hyperbolic System [143]
3. Examples [145]
4. The Difference Scheme. Boundedness of Solutions in the (?)-Sense [147]
5. Estimates for the Norms of Difference Quotients [151]
6. Sobolev's Lemma for Functions on a Lattice [153]
7. Proof of Convergence for the Difference Scheme [155]
Chapter 9. SOLUTION OF HYPERBOLIC SYSTEMS OF EQUATIONS IN Two INDEPENDENT VARIABLES: METHOD OF COURANT-!SAACSON-REES
Chapter 10. AN ELLIPTIC EQUATION: THE EQUATION OF LAPLACE
1. The Difference Scheme [163]
2. Existence and Uniqueness of Solutions of the Difference Equation [164]
3. Error Estimates [166]
4. Numerical Solution of the Difference Scheme [170]
Bibliography [174]
Index [177]

These Lectures on Numerical Analysis are essentially lectures notes of a course on "Advanced Numerical Methods" which the author gave in 1956-57 at the Institute of Mathematical Sciences at New York University. The original notes, prepared by S. d'Ambra and S. Locke, were distributed by the Institute for a number of years in mimeographed form. In the practice of numerical analysis it is important to be aware that computed solutions are not exact mathematical solutions. The precision of a numerical solution can be diminished in several subtle ways. Understanding these difficulties can often guide the practitioner in the proper implementation and/or development of numerical algorithms. Definition 1.1 Suppose x is an approximation to x*. The absolute error is Ex = |x* -x|. And the relative error is REx that x*≠0 . 2. Advanced Numerical Methods and Their Applications to Industrial Problems. — Adaptive Finite Element Methods. Lecture Notes Summer School Yerevan State University Yerevan, Armenia. 2004. Alfred Schmidt, Arsen Narimanyan Center for Industrial Mathematics. 3 Functional analysis background 3.1 Banach spaces and Hilbert spaces . . . 3.2 Basic concepts of Lebesgue spaces . . . 3.3 Weak derivatives . . .

Son of Afternotes on Numerical Analysis Being a series of lectures on advanced numerical analysis presented at the Univ Advanced Lectures on Networking. Lecture Notes in Computer Science Edited by G. Goos, J. Hartmanis, and J. van Leeuwen 2497 3 Berlin Heidelberg New Y Afternotes on numerical analysis. Afternotes on numerical analysis.Â Lectures on Stochastic Analysis Thomas G. Kurtz Departments of Mathematics and Statistics University of Wisconsin - Madi Lectures on semiclassical analysis. Lectures on semiclassical analysis version 0.2 lawrence C. evans and maciej zworski department of mathematics UC berkele Ã—. Report "Lectures on Advanced Numerical Analysis". Your name. Email. Advanced Numerical Analysis I. Course Description: This course covers basic numerical methods in the graduate level. The main themes are numerical solutions of PDEs and iterative methods for linear systems. For numerical solutions of PDEs, some basic theories of finite element methods for elliptic and parabolic equations are discussed. The topics include Sobolev spaces, embedding and trace theorems, variational formulation, Lax-Milgram theorem, finite element spaces and their interpolation theories, convergence in H1 and L2 norms. MA50174 ADVANCED NUMERICAL METHODS â€“ Part 1. I.G. Graham (heavily based on original notes by C.J.Budd).Â Objectives 1. To learn numerical methods for data analysis, optimisation,linear algebra and ODEs; 2. To learn MATLAB skills in numerical methods, programming and graphics; 3. To apply 1,2 to Mathematical problems and obtain solutions; 4. To present these solutions in a coherent manner for assessment. Schedule. 11 weeks of: 1 workshop in Lab; 1 lecture/problems class; 1 general lecture. Books â€¢ N and D Higham â€œMatlab Guideâ€ SIAM â€¢ Vettering et al â€œNumerical Recipesâ€ CUP â€¢ A Iserles â€œA First Course in the Numerical Solution of DEsâ€, CUP â€¢ C.R.MacCluer â€œIndustrial Maths, Modelling in Industry, Sc