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Exercises in computational mathematics with MATLAB.

Problem Books in Mathematics. Berlin: Springer (ISBN 978-3-662-43510-6/hbk; 978-3-662-43511-3/ebook). xii, 372 p. (2014).

This is an interesting new kind of book in the area of numerical analysis. The authors propose to study the standard topics of numerical analysis by solving exercises. Consequently, the text consists mainly of theoretical and programming exercises, 137 all together, and their solution, consuming approximately 160 pages. Most chapters begin with a short review of the corresponding topic. The reader is supposed to be principally familiar with the material, e.g. from a textbook or a lecture, but the idea is that he will study the topics more profoundly by solving exercises. The book is subdivided into the following 13 chapters: Chapter 1. An introduction to MATLAB commands (8 pp.); Chapter 2. Matrices and linear Systems (16 pp.); Chapter 3. Matrices, eigenvalues and eigenvectors (18 pp.); Chapter 4. Matrices, norms and conditioning (21 pp.); Chapter 5. Iterative methods (36 pp.); Chapter 6. Polynomial interpolation (28 pp.); Chapter 7. Bézier curves and Bernstein polynomials (22 pp.); Chapter 8. Piecewise polynomials, interpolation and applications (24 pp.); Chapter 9. Approximation of integrals (44 pp.); Chapter 10. Linear least squares methods (29 pp.); Chapter 11. Continuous and discrete approximations (32 pp.); Chapter 12. Ordinary differential equations, one step methods (41 pp.); Chapter 13. Finite differences for differential and partial differential equations (43 pp.). A nice detail is that in most chapters a biography of scientists who have made important contributions to the field is included. It is widely accepted that solving exercises is essential to achieve a deeper understanding of a mathematical topic. Under this point of view the present book can be seen as an adequate vehicle to really get into the field of numerical analysis. Of course, a good portion of self-discipline is required. But the book can also serve as a rich source of exercises for university courses.

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Classification: N15 U45

Keywords: basic topics in numerical analysis; problem book; theoretical problems; solutions; programming problems; MATLAB codes; exercise; textbook; matrices; linear systems; eigenvalues; eigenvectors; norms; conditioning; iterative methods; polynomial interpolation; Bézier curves; Bernstein polynomials; interpolation; linear least squares methods

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