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# Book Review

*Numerical Solution of Partial Differential Equations*, by G. D. Smith, 1965; 179 pages. (London: *Oxford University Press*, 25s.)

This book, intended mainly for students rather than for those already well versed in numerical methods, presents, through simple examples, the principal processes for obtaining numerical solutions to second-order quasi-linear partial differential equations, one chapter each being devoted to equations of Parabolic, Hyperbolic and Elliptic type. In addition there is an introductory chapter which includes the development of finite-difference approximations for derivatives, and one which covers the ideas of convergence, compatibility and stability of finite-difference schemes; and also iterative methods for solving sets of linear algebraic equations.

The author states in his preface that he has tried to make the main chapters independent of one another and admits that this has led to a certain amount of repetition. For example, the Jacobi, Gauss-Seidel and S.O.R. point iterative methods for solving sets of linear algebraic equations appear three times. In Chapter 2 they are applied in detail to a specific example, complete with numerical results; in Chapter 3 they are studied in more general form, and Chapter 5 presents them briefly in connection with Poisson's equation. A good understanding of these methods can be obtained from the sections in Chapters 2 and 3 and surely these would have been better presented together.

In Chapter 2 the main finite-difference methods for solving Parabolic equations are explained and illustrated clearly with detailed numerical calculations. Chapter 4, perhaps the weakest section of the book, presents both the method of characteristics and of finite differences for solving Hyperbolic equations but might have gained something by the inclusion of a section on first-order equations which appear only in the exercises at the end of the chapter. The fifth chapter gives the principal finite-difference methods for Elliptic equations, including a section on relaxation.

Each of the four main chapters includes a very valuable set of exercises with solutions outlined in most cases, and the volume concludes with a list of references for further reading.

Most students should find that this book gives them a good introduction to the subject but they may not be able to understand some of the more advanced concepts, several of which are not explained or illustrated as carefully as many of the simpler ideas. As examples we might cite parts of the section on characteristics of hyperbolic equations, the concept of consistent ordering for sets of algebraic equations, and the method of deferred correction which is dismissed in less than a page. There is, however, sufficient of value to recommend this as a student textbook, and it should also find its way on to the book-shelves of most teachers of the subject.

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