it is necessary to read this book from the beginning in order to read any later section. Although there is a lot of cross referencing, there is no table of notations, and by the midpoint there are so many notational conventions (e.g. which type of letter represents a member of which space, which letter represents the local error, etc.) that a quick run through the book is not possible. However, the time spent in carefully reading the first two chapters is amply rewarded by the density of material presented in relatively few pages of the last four chapters.

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35 [5]. — GILBERT STRANG & GEORGE J. FIX, *An Analysis of the Finite Element Method,* Prentice-Hall, Englewood Cliffs, N. J., 1973, xiv + 306 pp., 24 cm. Price \$16. —.

Few are able to present sophisticated analytical developments in a simple, practical, and easily digestible form. Strang and Fix have succeeded! Their book shows the mark of men who have contributed to the development of the field. They get right to the heart of the subject matter, without introducing extraneous mathematical embellishments. Their prose is a pleasure to read, their mathematical taste is elegant, and their numerical techniques are simply described and evaluated for efficiency. This book will be a delightful graduate text and reference work for a broad audience. Its spirit can best be described by quoting from the Preface:

"Its purpose is to explain the effect of each of the approximations that are essential for the finite element technique to be computationally efficient. We list here some of these approximations:

(1) interpolation of the original physical data

(2) choice of a finite number of polynomial trial functions

(3) simplification of the geometry of the domain

(4) modification of the boundary conditions

(5) numerical integration of the underlying functional in the variational principle

(6) roundoff error in the solution of the discrete system.

"These questions are fundamentally mathematical, and so are the authors. Nevertheless, this book is absolutely not intended for the exclusive use of specialists in numerical analysis. On the contrary, we hope it may help establish closer communication between the mathematical engineer and the mathematical analyst. It seems to us that the finite element method provides a special opportunity for this communication: the theory is attractive, the applications are growing, and best of all, the method is so new that the gap between theory and application ought not yet to be insurmountable.

"Of course, we recognize that there are obstacles which cannot be made to disappear. One of them is the language itself; we have kept the mathematical notations to a minimum, and indexed them (with definitions) at the end of the book. We also know that, even after a norm has been interpreted as a natural measure of strain energy, and a Hilbert space identified with the class of admissible functions in a physically derived variational principle, there still remains the hardest problem: to become comfortable with these ideas, and to make them one's own. This requires genuine patience and tolerance on both sides, as well as effort. Perhaps this book at least exhibits the kind of problems which a mathematician is trained to solve, and those for which he is useless."

E. I.

36 [**5, 6**].—I. I. GIHMAN & A. V. SKOROHOD, *Stochastic Differential Equations*, translated from the Russian, Springer Verlag, New York, 1972, viii + 354 pp., 24 cm. Price $27.90.

This book is a treatise on stochastic equations by two well-known authors in probability theory. It is a theoretical work and much attention is devoted to developing the foundations: existence, uniqueness, regularity, etc. The book presents many other results; for example it treats asymptotic behavior, which should be of direct interest to readers with applied interests. The authors do not treat specific applied problems in detail. Let us give a brief review of the contents of the book which is arranged in two parts.

Part I deals with one-dimensional stochastic differential equations of first order exclusively. Chapter 1 gives a succinct treatment of K. Itô's theory of stochastic integrals. Chapter 2 deals with existence and uniqueness, again following K. Itô's methods, i.e., a stochastic Picard iteration method. The authors are careful here, as well as in the rest of the book, to single out the necessary hypotheses and avoid unnatural restrictions. In Chapter 2, they give a thorough analysis of the dependence of solutions on parameters. This is important in establishing the connection of stochastic differential equations and partial differential equations. Chapter 3 analyzes the connection just mentioned and the Markov character of the solutions of stochastic equations. One finds that probabilistic methods yield very strong results on the existence, uniqueness, and regularity of parabolic partial differential equations. Moreover, these results do not depend upon uniform ellipticity assumptions. Chapter 4 deals with the asymptotic behavior of the solutions of stochastic equations. The results of this chapter are very sharp and many are not available elsewhere. Chapter 5 treats problems on a finite interval and gives a thorough analysis of boundary behavior as well as asymptotic behavior.

Part II examines systems of stochastic differential equations. Chapter 1