reviewer's opinion that, even with this material, students lacking a strong background in these subjects will find the book extremely heavy going. In the main the presentation is unduly theoretical, and many concepts are introduced with little or no motivation. Furthermore, much notation is used without definition, there is a paucity of illustrative numerical examples, and no exercises are provided.

In the set of appendices, computer programs are provided which implement some of the techniques mentioned in the text, or minor modifications of them. The manner in which these codes are presented lacks uniformity and tends to confuse. In all but one of the appendices, subroutines defining test examples are given. On occasions, the test example coded is not the example discussed in the description of the use of the code. Also, for some of the test examples, a driving program is not provided.

The list of references is surprisingly short, containing fewer than forty papers, the remaining references being books and theses. One reason for this is that the authors fail to give explicit credit for many of the methods and theorems appearing in the text, for example, the high order correct method of Douglas (page 108) and Kahan's Theorem (page 365).

The book covers many interesting topics, but the reviewer has serious reservations regarding its suitability as a text in a numerical analysis course. The authors present a rather limited view of the subject, concentrating almost entirely on difference methods. Few techniques are presented which could be labelled as modern computational tools, and as a result it is unlikely that anyone wishing to solve partial differential equations will find much of value in this book. In short, the book does not appear to be a serious competitor to other available texts which discuss more recent developments in the numerical solution of partial differential equations.

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9[65H99].–C. B. GARCIA & W. I. ZANGWILL, *Pathways to Solutions, Fixed Points, and Equilibria*, Prentice-Hall, Englewood Cliffs, N. J., 1981, vii + 479 pp., $23\frac{1}{2}$ cm. Price $32.00.

In recent years, the subject of the numerical solution of nonlinear equations has been enriched by ideas from topology. Iterative methods such as Newton's method have been given a global setting, existence theorems from topology have been given constructive proofs, and both combinatorial and differential methods have been utilized to construct solution algorithms and computer programs for the solution of nonlinear systems. The book of Garcia and Zangwill gives a spritely survey of work in this area, with emphasis on path following as a theoretical and algorithmic tool. In addition, there is extensive material on applications to nonlinear programming, equilibrium programming, economic modelling, game theory, and network models.

The book contains 22 chapters and three appendices and is divided into four parts. Part I contains an exposition of the ideas of continuation and degree theory, including the Basic Differential Equation, a device which has been effectively exploited by the authors to give a self-contained development of degree theory. Part II, comprising over 1/3 of the book, contains the applications. An enthusiastic discussion is given of equilibrium programming and its philosophical implications. The other applications are shown to be special cases of equilibrium programming, and, in all cases, continuation arguments are used to prove the existence theorems for these applications. Part III covers algorithms. The traditional numerical analyst will be disappointed here. In the differential case, continuation uses a mixture of techniques drawn from the numerical solution of ordinary differential equations and the local numerical solution of nonlinear systems. Both of these subjects have been developed to a high degree, and the treatment in this book does not reflect this development. On the combinatorial side, the authors do not give any specific triangulations, or discuss the relative merits of different triangulations. They give no algorithms or computer programs. What they do provide is a lucid account of the ideas that go into the simplicial and differentiable methods for path following. Part IV contains a chapter on the calculation of all complex solutions of polynomial systems, two chapters on the linear complementarity problem, a chapter on the Kakutani fixed point theorem, and a final chapter giving an intuitive discussion of the Sard and Weierstrass theorems.

The book provides a broad picture, with some technical mathematical details left to journal articles. It is well written, often using vivid images to illustrate the mathematical ideas. Each chapter concludes with a number of exercises. It should have a salutary effect in the dissemination of ideas from numerical analysis and applied topology to an audience that includes students of economics, operations research, and game theory.

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10[65–06].–P. Rozsa (Editor), *Numerical Methods*, Colloquia Mathematica Societatis János Bolyai, Vol. 22, North-Holland, Amsterdam and New York, 1980, 631 pp., 24 cm. Price \$87.75/Dfl. 180.00.

This volume contains 41 lectures delivered at the Colloquium on Numerical Methods held in Keszthely, Hungary, from September 4–10, 1977. The papers cover the following areas of numerical mathematics: ordinary and partial differential equations including initial value, boundary value, and stiff problems; numerical algebra such as matrix eigenvalue problems, generalized matrix inverses, recursive computations; unconstrained and constrained optimization; elliptic functions; applications of splines.

11[65–06].–C. A. Brebbia (Editor), *Boundary Element Methods*, Springer-Verlag, New York, Heidelberg, Berlin, 1981, xxiv + 622 pp., $23\frac{1}{2}$ cm. Price \$59.00.

This is the proceedings of the Third International Seminar held at Irvine, California, in July, 1981. It contains 39 papers divided into the following sections: I Potential and Fluid Flow Problems, II Elasticity Problems, III Geomechanics, IV