The idea of such a book is a good one; carefully chosen illustrative problems could help experienced teachers of the area as well as those inexperienced in the area but called upon to teach such courses. Unfortunately, the present text falls far short of this ideal. Firstly, the choice of methods to be described is disappointing; one finds no mention, for example, of bisection, regula falsi (as opposed to the secant method), partial pivoting, QR, trapezoid rule, et cetera. Of course, the problems can be used independently of the explanatory material. Secondly, the problems are purely computational with no attempt to illustrate important aspects of theory such as convergence rates, error estimates, instability, ill-conditioning, et cetera; the typical problem is: "Use method M to solve problem P." Again, one can select the problems for these purposes oneself, but the question is how to find a particular problem to illustrate a particular point. It is just as easy to make up one's own problem.

Thus, the book probably can serve mainly as a source of numerical problems with numerical answers. It is almost as easy, however, to make up one's own problems for assignment and deduce the correct answer from students' computer output.

I cannot attest to the accuracy of the answers given. On four problems (31, 70, 72 from Chapter 2; 25 from Chapter 3) the answers appeared to be correctly rounded to all figures given, as compared at least to answers produced on the CDC 6600 at the University of Texas using some of the best methods available.

J. W. D.

46 [2.35, 3].—S. L. S. Jacoby, J. S. Kowalik & J. T. Pizzo, *Iterative Methods for Nonlinear Optimization*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1972, xi + 274 pp., 24 cm. Price $17.30.

An introductory chapter contains examples, definitions of convexity, first-order optimality conditions, discussion of the meaning of rate of convergence, and the traditional test problems that algorithmists use to try out their optimization codes. Chapter 2 gives ways of transforming problems and variables to facilitate obtaining solutions. Chapter 3 discusses methods for optimizing along a line, concentrating on those methods requiring only function evaluations. The usual direct search methods for solving unconstrained problems are found in Chapter 4, and Chapter 5 contains discussions of steepest descent, conjugate directions, quasi-Newton, modified Newton, and other methods for minimizing unconstrained functions. Chapter 6 discusses how general constrained problems can be solved by solving unconstrained (or merely linearly constrained) problems. Chapter 7 discusses direct methods for constrained problems including MAP, the cutting plane method, the gradient projection method, and the reduced gradient method. A concluding appendix on auxiliary techniques, such as the SIMPLEX method, is followed by a useful glossary.

Most chapters have a "Computing Systems" section which is unique in books on optimization. It contains references to codes implementing the algorithms developed in the book. Another area of strength is the integration of the numerical analysis point of view into solving the systems of linear equations required by many of the algorithms. There is a lack of precision in the definitions, and some of the material should have been deleted or further explained (such as the suggestion to eliminate two constraints $b_i \leqq x_i \leqq u_i$ by the variable transformation $x_i = b_i + (u_i - b_i)\sin^2(y_i)$). There is a wealth of material; much neglected work done by engineer optimizers is included. It is not a text book. It has no problems and no small numerical examples. The authors have achieved their main aim, to synthesize and explain the vast amount of algorithmic material now extant in the optimization area.

GARTH P. MCCORMICK

Mathematics Department
George Washington University
Washington, D.C. 20006

47 [2.35, 5].—DAVID M. YOUNG, *Iterative Solution of Large Linear Systems*, Academic Press, New York, 1971, xxiv + 570 pp., 24 cm. Price $25.00.

In his 1950 Harvard thesis, David Young laid a solid theoretical foundation for the successive overrelaxation (SOR) method. Overall, this method perhaps remains the most useful method for the solution of large sparse systems of algebraic equations and, in particular, those which arise in the numerical solution of elliptic partial differential equations. The main topic of the present book is the study of the rate of convergence of the SOR method, its many variants and various semi-iterative methods. Much of the material is already quite familiar from Richard Varga's well-known textbook *Matrix Iterative Analysis* (1962). However, in recent years David Young and his coworkers have systematically explored many important aspects of the theory. Of perhaps greatest general interest are some new results on the use of a combination of the symmetric successive overrelaxation (SSOR) method with semi-iteration. For the standard second-order finite difference approximation to Laplace's equation and the natural ordering, good values for acceleration parameters can be found which lead to an order-of-magnitude gain in the rate of convergence (i.e., $R \sim h^{-1/2}$) compared to that of the optimal SOR method (i.e., $R \sim h^{-1}$).

The use of a line version of SSOR is shown to give further gains. It appears that further study of these potentially very powerful methods applied to more general elliptic problems could be very profitable.

This book requires only a background corresponding to a standard undergraduate mathematics program. The book is self-contained and admirably clearly written. The theory is illustrated by well-chosen examples worked out in sufficient detail. The usefulness of the book is further enhanced by many exercises. It is a most welcome addition to both the textbook and handbook literature.

OLOF WIDLUND

Courant Institute of Mathematical Sciences
New York University
New York, New York 10012

48 [7].—L. N. KARMAZINA, *Tablit͡sy funkt͡siĭ Lezh͡andra ot mnimogo argumenta* (*Tables of Legendre functions of imaginary argument*), Akad. Nauk SSSR, Moscow, 1972, x + 391 pp., 27 cm. Price 3.86 rubles.