obvious. But the main difficulties with the presentation must have existed in the original version.

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**50[X].**—I. G. Petrovski, *Ordinary Differential Equations*, translated by Richard A. Silverman, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1966, x + 232 pp., 24 cm. Price $7.95.

The work under review covers a variety of topics in the field of ordinary differential equations, and also contains a brief supplement on first order partial differential equations. The scope and level of the material is such that, in terms of an American university curriculum, it fits a senior level or first year graduate level one semester course for mathematics majors.

In principle no prior acquaintance with the field of differential equations is required. In the first two chapters the basic ideas are introduced. The discussion of the special solvable cases is unusually careful and detailed. The chapter devoted to existence and uniqueness theorems is among the best in the book. Arzéla's theorem is proved and used to prove Peano's existence theorem. Uniqueness questions are then discussed via Osgood's uniqueness theorem. The method of successive approximations is then discussed as an application of the fixed point theorem for contracting mappings. The classical Cauchy theorem regarding analytic cases is also discussed. The same chapter covers in detail the continuous dependence of solutions on initial data and parameters.

The chapters covering linear systems are adequate. The sections devoted to the canonical form of linear systems with constant coefficients are unnecessarily cumbersome. A simple statement of the Jordan form for square matrices and its application to linear systems would have been adequate. Lyapunov's second method is introduced to discuss some stability questions. The proof of the theorem on p. 151 regarding asymptotic stability is faulty. The function $V$ must also be assumed to have an "infinitesimal upper bound" to guarantee asymptotic stability (see Massera, *Ann. of Math.* **50** (1949), 118-126.)

The last chapter is devoted to a number of topological questions; limit cycles are discussed briefly. A proof of the Brouwer fixed point theorem is given and some nice applications of that theorem are provided. The supplement is devoted to those aspects of first order partial differential equations that can be discussed in terms of ordinary differential equations. A brief and good introduction to generalized solutions is provided.

As has been indicated, those topics covered in the book are done well. Unfortunately there are many other topics that are completely omitted. For example, there is no mention of classical stability theory, linear systems with periodic coefficients, perturbation theory, boundary value problems (Sturm-Liouville problems), Green's functions, and equations with singularities, especially Fuchsian singularities (Legendre polynomials, Bessel functions etc.). There are many aspects of nonlinear differential equations which have come to prominence in recent years. These are, by and large, ignored. From this reviewer's point of view these omissions are serious and will severely limit the utility of this book. Nevertheless there will be some who will find the exceptional features of this book adequate compensation for its shortcomings.

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**51[X].**—JAMES B. SCARBOROUGH, *Numerical Mathematical Analysis*, Sixth Edition, The Johns Hopkins Press, Baltimore, Md., 1966, xxi + 600 pp., 24 cm. Price $8.50.

This veteran textbook, originally copyrighted in 1930, is well known to numerical analysts and has been reviewed time and again. In this, the sixth edition, nothing has been added which alters the basic strengths and weaknesses of the previous editions. The alterations are in fact quite minor. They consist of a belated introduction of the trapezoidal rule for quadrature, of a slight modification of the regula-falsi method for root-finding, and of some formulas of Runge-Kutta type (due to Kooy and Uytenbogaart) for solving systems of second order differential equations. It is unfortunate that while introducing the trapezoidal rule the author did not deem it advisable to introduce the related (but more useful methods) of Romberg integration and the trapezoidal rule with end corrections. For those interested in solving problems on desk calculators this book should continue to be appealing. For those interested in solving problems using computers there are a number of books now on the market which should be preferred.

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**52[X].**—BURTON WENDROFF, *Theoretical Numerical Analysis*, Academic Press, New York, 1966, xi + 239 pp., 24 cm. Price $10.95.

An accurate and brief description of this book is given by the author,

"My purpose in writing this book is to present numerical analysis as a legitimate branch of mathematics, deserving attention from mature mathematicians and students alike. In keeping with this theme the reader will find himself traveling a narrow, often deep path through five basic fields of numerical analysis: interpolation, approximation, numerical solution of ordinary and partial differential equations, and numerical solution of systems of equations. The direction and depth of the path, while largely a matter of my own taste, are constrained when feasible so as to lead to a consideration of good computing technique (large scale digital)."

He succeeds admirably! This book should prove to be an excellent reference work for practical numerical analysts, for advanced graduate students and for others interested in the elegant and unified presentation of tastefully selected topics.

E. I.