equations. The contents include: (i) general methods of investigating and solving systems of linear equations; (ii) convenient, practical methods for solving systems approximately or exactly; (iii) the real meaning of inconsistent systems and their approximate solution; (iv) the graphic solution of systems and the application of these methods to the solution of some problems in science and engineering. In such a compact volume, the discussion is understandably limited to systems involving only a small number of variables, but the arguments are presented with such clarity that the reader can easily extend them to more complex systems.

The opening chapter is devoted to deriving several systems of linear equations from physical problems, on application of Kirchoff's laws to an electrical circuit, for example. Subsequent chapters deal with basic definitions and methods of solution of systems, including detailed discussion of such techniques as reduction to triangular form, use of Gauss' tables, Cramer's rule, and methods of classification of systems. The section dealing with the approximate solution of systems, both consistent and inconsistent, is especially pleasing, as illustrated by the author's lucid exposition of the method of least squares. Finally, graphical solutions are given in detail for systems involving less than four variables. Worked examples throughout are based on the systems arising in the opening chapter, while each chapter concludes with exercises based on the text. Errors are limited to four misprinted symbols.

The author has striven, with the greatest success, to produce a book which is eminently readable. Both exposition and layout are outstanding; all proofs and discussions are given in the fullest detail, so that this book can be most strongly recommended for unassisted reading by any undergraduate student of science or engineering, at whom it is primarily aimed. D. J. TEMPERLEY

KANTOROVICH, L. V. AND AKILOV, G. P., *Functional Analysis in Normed Spaces*, translated from the Russian by D. E. Brown, edited by A. P. Robertson (Pergamon Press, 1964), xiii + 771 pp., 140s.

Part I of this large book is mainly a leisurely and expanded version in 462 pages of classical functional analysis, namely those parts of Banach's *Théorie des opérations linéaires* that have become standard tools of analysis. Much emphasis is placed on the identification of bounded linear mappings between certain concrete function spaces, and there is a useful account of Sobolev's generalisation of the Poincaré inequality. Part I also contains the elements of the theory of Hilbert spaces, including a proof of the spectral theorem for bounded self-adjoint operators, and ends with a chapter on linear topological spaces which seems almost entirely unrelated to the rest of the book.

The first two chapters of Part II (XII Adjoint equations, XIII Functional equations of the second kind) also consist of standard Riesz-Schauder-Banach theory; and so it seems to the reviewer that the real justification for the translation of this book lies in its last five chapters:—XIV. The general theory of approximation methods, XV. The method of steepest descent, XVI, The fixed point principle, XVII. The differentiation of non-linear operations, XVIII. Newton's method. These cover much less readily accessible material, and illustrate it with a wealth of concrete applications.

The reviewer would not recommend Part I as an introduction to functional analysis in competition with the many excellent books that have appeared in recent years. However the book is welcome for its last five chapters, and for the illustrations that it contains of some of the applications of functional analysis to differential equations. It may be a useful reference book for numerical analysts and applied mathematicians, but the reader who uses the book for occasional reference must use some care. For example, the word " linear " is not used in the sense now usual in the west, and in a detailed reading of a small (non-random) sample of the book the reviewer found a rather large number of misprinted symbols which are correctly printed in the Russian edition.

F. F. BONSALL

F. M. ARSCOTT, *Periodic Differential Equations* (Pergamon Press, 1964), vii+275 pp., 602.

This book contains an account of a class of linear ordinary differential equations and the special functions generated by them. The author explains in the Preface that he has concentrated on fundamental problems and techniques of solution rather than the properties of particular functions. He has attempted to steer a middle course between books written primarily for engineers and those demanding a knowledge of advanced pure mathematics on the part of the reader. At the same time, he has tried to enable the reader to pass on to a more detailed study of either of the two types of books. The reviewer feels that the author succeeded in the task he set himself and produced a very useful and readable book. He is to be commended for the care with which the book was written; for using as far as possible the notations used in the books to which the reader might proceed from his; for providing ample documentation and references; and for greatly increasing the information contained in his book by the device of adding " examples " (i.e. mostly results from the literature not discussed in detail in the present book) to each chapter. There was no attempt at encyclopaedic completeness, and in spite of the considerable amount of material, the book makes an uncluttered impression.

After an introductory chapter, mostly on the origin of the various differential equations treated in this book, about one-half of the book is devoted to Mathieu's equation,

$$w''+(a-2q\cos 2z)w = 0.$$

Both the " general " equation (i.e., the equation with arbitrary given values of a and q) and Mathieu functions (the solutions for characteristic values of a for which a periodic solution exists) are treated.

In the second half of the book, one finds a variety of differential equations and their solutions: Hill's equation, the spheroidal wave equation, the differential equation satisfied by Lamé polynomials, and the ellipsoidal wave equation.

A. ERDÉLYI

NAIMARK, M. A., *Linear Representations of the Lorentz Group*, translated from the Russian by Ann Swinfen and O. J. Marstrand (Pergamon Press, 1964), pp. xiv+450, 100s.

One's first reaction on opening this book is to marvel that it is possible to write a book of four hundred and fifty pages on the representations of the Lorentz group, particularly so since this volume is not concerned with the generalised Lorentz group of r spatial and s temporal dimensions but only with the group of Lorentz transformations of the 3+1 space-time world. The full Lorentz group $\mathcal{G}$ (called the general Lorentz group by the author) is the set of all real linear transformations $x_i' = \sum_i g_{ij}x_j$ which leave $x_1^2+x_2^2+x_3^2-x_4^2$ invariant. This group consists of four disjoint pieces, the most important of which from the physical point of view is the subgroup called the proper Lorentz group $\mathcal{G}_+$ whose transformations satisfy $|g_{ij}| = +1$, $g_{44} \geqq 1$. The proper Lorentz group $\mathcal{G}_+$ is a normal subgroup of index 2 of the complete Lorentz group $\mathcal{G}_0$ whose transformations are required to satisfy the less stringent condition $g_{44} \geqq 1$ and amongst which are spatial reflections such as $x_1' = -x_1$, $x_2' = x_2$, $x_3' = x_3$, $x_4' = x_4$ for which $|g_{ij}| = -1$. $\mathcal{G}_0$ is in turn