completed when the author died. It is now published in an excellent French translation (with some revision) by Mlle. E. Mourier and with a preface by M. Fréchet. The reader requires no special knowledge of functional analysis as all the relevant definitions are given, and the subject developed from first principles. Occasionally it has been necessary to quote general theorems or special results outside the scope of the book and adequate references are then given.

The book opens with an account of the classical theory of Volterra integral equations of the second kind and then introduces the basic ideas of polynomial (Fréchet) analytic function and (Fréchet) differentiation, in general Banach spaces. The techniques of the abstract differential calculus are then developed and in the later chapters applied to the theory of the classical Volterra and Fredholm integral equations and to the study of the solutions of systems of ordinary linear differential equations, regarded as functions of the coefficients occurring in the equations. The discussions are all extended to cover far-reaching generalisations of these notions. The final chapter is concerned with the exponential function in Banach algebras and general Banach spaces.

This first volume gives a clear and readable account of a theory of abstract differential calculus which is little known in this country. It is to be followed by a volume dealing with applications to geometry and theoretical physics, in which the slight deficiencies of the fairly exhaustive bibliography of the first volume will no doubt be remedied.

D. J. HARRIS

Library of Mathematics—(i) *Linear Equations* by P. M. COHN, (ii) *Sequences and Series* by J. A. GREEN, (iii) *Differential Calculus* by P. J. HILTON, (iv) *Elementary Differential Equations and Operators* by G. E. H. REUTER (Routledge and Kegan Paul, 1958), 5s. each.

This series of short text-books is edited by Dr Walter Ledermann of the University of Manchester and the above volumes are the first four to appear. They are paper-backed and consist of about seventy pages each. The publishers say that they are primarily intended for readers who study mathematics as a tool rather than for its own sake and the aim is to cover the topics which are usually included in course of mathematics for scientists, engineers and statisticians at universities and technical colleges. While this is true, a perusal of these first four volumes shows that they would be useful to students in the last year at school and in the first year at the university who propose to take a degree in mathematics itself.

The books are good value at their price and if the high standard of these four volumes is maintained, the series should be very successful. The outstanding features of all these books are the clarity of exposition and the care which has been taken to give a full and detailed discussion, so that the student is not held up by irritating gaps in the argument. A word or two will now be said about the scope of the individual volumes.

(i) In the book on *Linear Equations* the properties of vectors and matrices necessary for the solution of a set of linear equations are developed in some detail. Both the nature of the solution and a practical method of solving the equations are discussed with many simple illustrative examples. The book closes with a short chapter on determinants.

(ii) The volume on *Sequences and Series* is an excellent introduction to the ideas, which are often found so difficult by a beginner, associated with the convergence of sequences and series of real numbers. There are many simple examples to illustrate the theory. Students wishing to use infinite series as a tool will find useful the treatment of the estimation of approximations to the numerical value of a series.

(iii) *Differential Calculus* deals with the differentiation of functions of a single variable, including the mean value theorem, Taylor's theorem and Newton's method

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for the approximate solution of equations. The emphasis is on the underlying ideas of the subject and, while complete in itself, the book should be of greatest value to students who have already at school had some training in technique of differentiation.

(iv) *Elementary Differential Equations and Operators* deals entirely with linear equations with constant coefficients. After an introduction to the solution of these equations by the usual elementary methods, the main part of the book is devoted to an account of the operational method of solution of such equations with given initial conditions. The illustrative examples are well chosen and worked out in great detail.

R. P. GILLESPIE

COLOMBO, S., *Les transformations de Mellin et de Hankel*, Monographies du Centre d'Études Mathématiques en vue des Applications, B. Méthodes de Calcul. (Centre National de la Recherche Scientifique, Paris, 1959), 99 pp., 15s. 6d.

The purpose of this little book is to present to physicists the essentials of integral transforms and of the transform method in applied mathematics, especially as applied to the theories of potential and of heat conduction. Its chapters, in order, deal with transforms in general, with particular reference to Fourier and Laplace transforms (32 pp.), the Mellin transform (16 pp.), the Hankel transform (12 pp.), applications to partial differential equations (16 pp.), dual integral equations (9 pp.). There is a bibliography of 35 items, chiefly books.

Proofs are omitted or merely sketched, as one would expect, and I feel that the author would have served applied mathematicians better had this policy been extended to choice of material. The relatively long first chapter deals with matter which is very well covered in several books, and would have been better confined to those theorems on the two-sided Laplace transform which can be usefully transcribed into theorems on the Mellin transform. In other chapters topics are introduced but not pursued; e.g. the short section on Poisson's summation formula would have been improved by showing how it can be used for the numerical evaluation of finite integrals.

The applications illustrate the use of Mellin and Hankel transforms in the Dirichlet problems for a wedge and for an infinite and for a finite slab, in the problem of non-steady heat conduction in an infinite slab, and in the problem of the electrified disc. In a very brief mention of axially symmetric potentials the surprising statement is made that the Hankel transform cannot be applied when the number of dimensions exceeds three.

R. D. LORD

WILLMORE, T. J., *An Introduction to Differential Geometry* (Clarendon Press: Oxford University Press, 1959), 326 pp., 35s.

In recent years there has been a regrettable tendency in British Universities for the study of differential geometry at the undergraduate level to be reduced to a minimum, or even to be cut out altogether. To do this is a great mistake, because there is much that is of interest in modern differential geometry. Now that Dr Willmore's book has appeared, there is no excuse. Even a cursory examination will reveal that the subject is both fascinating and challenging.

The book is divided into two parts. The first is concerned with curves and surfaces in three-dimensional Euclidean space. Of the four chapters in this part, the first three are devoted to the classical local differential geometry of curves and surfaces. In substance, there is no difference between this part of the book and the corresponding sections of older works. But the approach is more rigorous, and the reader is warned of the assumptions that must be made in order to ensure that the formulæ are applicable. Clearly Dr Willmore has been influenced by being in the neighbourhood of an analyst.

Chapter IV is very different, for in it we are introduced to differential geometry in the large. Here we are concerned with properties relating to whole surfaces and