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 not just to convenient regions of them. Some knowledge of topology is needed for an understanding of this chapter, and Dr Willmore makes it clear that he has not attempted to give a complete account. Nevertheless this chapter is both interesting and important. The material in it should, if possible, be included in any course on differential geometry for Honours undergraduates. Indeed, Part I of the book forms an excellent basis for a course which should be undertaken by all candidates for an Honours Mathematics degree.

The second part of the book deals with differential geometry in *n* dimensions. A chapter on tensor algebra precedes the introduction of tensor calculus as applied to differential manifolds. Some may find the definition of tensor a little remote for practical purposes. But at least there *is* a definition of tensor, which is more than can be said for those text-books which purport to define tensors but only define tensor components. The invariance of a tensor is the most important thing about it, and Dr Willmore is quite right to stress this from the beginning. A chapter on Riemannian geometry follows, and this includes mention of some fairly recent results on topics such as harmonic Riemannian spaces. There is also a readable account of Élie Cartan's methods of investigating problems in Riemannian geometry, and this should prove most valuable to post-graduate students. Finally, there is an account of tensor methods applied to surface theory, and the greater power of these methods as compared with the vector methods of the earlier part of the book is illustrated.

This is an important, interesting and well-written book. The style is clear and unpretentious and the printing conforms to the high standard set by the Oxford University Press.

E. M. PATTERSON

BIRKHOFF, G. D., AND BEATLEY, R., *Basic Geometry* (Chelsea Publishing Co., New York, 1958), 294 pp., $3.95.

This textbook has been published, following classroom experience with an experimental edition, by two professors from Harvard University. It is designed to cover a year's work in an American high school, and seems to be aimed at an age group of about 16. The emphasis is on logical deduction rather than on a list of geometrical theorems, it being assumed that this facility will be carried over to arguments dealing with " real life ".

The geometry is developed from five assumptions as follows: (1) points on any straight line can be numbered so that number differences measure distances, (2) there is one and only one straight line through two points, (3) all half-lines having the same end-point can be numbered to measure angles, (4) all straight angles have the same measure, (5) the (S.A.S.) case of similar triangles.

The number system is defined to contain all real numbers, rational or irrational, and from this basis seven theorems are derived. The geometry is then developed rapidly in the following order: (*a*) parallel lines and networks, (*b*) the circle and regular polygons, (*c*) ruler-compass constructions, (*d*) area and length, (*e*) continuous variation, (*f*) loci; the whole being rounded off by brief references to power, coaxal circles, inversion and projection.

There are numerous exercises, many being standard theorems in British textbooks. All are expected to be done, though the aid of the teacher would obviously be required in many of them. Although this book is not suitable as a textbook in this country, it has great interest in showing a development quite foreign to ideas current in our schools, and could prove very useful in the training colleges.

G. ALLMAN

KEMENY, J. G., AND SNELL, J. L., *Finite Markov Chains* (D. van Nostrand Co. Ltd., London, 1960), 210 pp., 37s. 6d.

If this book is regarded from the point of view of the undergraduate at whom