SMITH, M. G., *Laplace Transform Theory.* New University Mathematics Series (Van Nostrand, 1966), 116 pp., 35s. (cloth bound), 18s. (paperback).

This book contains a short rigorous account of Laplace transform theory and some of its applications. It is written in a lucid manner and should be easily accessible to undergraduate mathematics and science students who have had elementary courses in complex analysis and differential equations. There are ample exercises included to test the student's mastery of the subject matter.

The Laplace transform is treated as a special case of a complex Fourier transform. Both the uniqueness and inversion theorems are deduced from the Fourier integral theorem, the proof of which is included in an appendix. There are four chapters discussing the application of Laplace transforms to ordinary linear differential equations, partial differential equations, linear integral equations, and difference equations. The final chapter discusses briefly the asymptotic relations existing between a function and its Laplace transform. M. LOWENGRUB

POGORZELSKI, W., *Integral Equations and their Applications*, Volume I, translated from the Polish by J. J. Schorr-Con, A. Kacner and Z. Olesiak (Pergamon Press, 1966), xiii+714 pp., 120s.

This book is the first volume of a translation made from the original Polish edition published between 1953 and 1960. Part I is an account of the classical theory of Fredholm and Volterra equations. Most of the material is standard and is available in several other texts. The author's treatment is however detailed and full, and can be recommended for an undergraduate course on integral equations. Part II deals with systems of linear integral equations, non-linear integral equations and the applications of integral equations in the theory of elliptic, hyperbolic and parabolic partial differential equations. A short appendix on Schauder's Fixed Point Theorem by R. Sikorski is included. This part deals with much less readily accessible material than the other parts. Part III deals with singular integral equations and contains chapters on the properties of Cauchy type integrals, the Hilbert and Riemann boundary value problems, linear singular integral equations together with some applications, non-linear singular integral equations for contours and discontinuous boundary value problems in the theory of analytic functions. Much of the material is however available elsewhere notably in the books by Muskhelishvili and Gakhov.

The book is a useful addition to the literature on integral equations in that it gives in one volume a comprehensive account of linear and non-linear integral equations including singular ones and their applications. W. D. COLLINS

TUTTE, W. T., *Connectivity in Graphs* (Toronto University Press; London: Oxford University Press), 145 pp., 42s.

The author's preface states: " Graph theory is now too extensive a subject for adequate presentation in a book of this size. Faced with the alternatives of writing a shallow survey of the greater part of graph theory or of giving a reasonably deep account of a small part, I have chosen the latter. I have written indeed as though the present book were to be the first section of a three-volume work."

The only prerequisites for understanding this book are a knowledge of elementary set theory and possibly a certain minimum of mathematical maturity. Only finite undirected graphs are considered. Self-contained treatises on graph theory usually need a fair amount of introductory material to describe the basic concepts required: this is done mainly in Chapters 1-4 and 6. Chapter 5 deals with Euler paths. Chapter 7 discusses the automorphism group of a graph, and in particular certain matters concerning graphs which " look the same from every vertex ", i.e. in which any vertex can be mapped into any other by an automorphism of the graph. Chapter 8 is entitled " Girth ", the *girth* of a graph being the minimum of the lengths of all circuits in the graph. There is some interest amongst a number of graph-theorists in finding graphs, with given girth γ and with all vertices of given degree k, in which the number of vertices is minimal: detailed solutions are here discussed for $k=3$, $\gamma \leqq 8$. It is perhaps doubtful whether the title of the book is quite appropriate to Chapters 5, 7 and 8, but connectivity is certainly the theme of the subsequent chapters. The *connectivity* $\lambda(G)$ of a graph G is defined as the least integer k for which G is expressible as $H \cup K$, where H, K are subgraphs of G with at least k edges each (to exclude trivial partitioning of G) and with exactly k common vertices and no common edges. Thus G is separable, in the usual sense, if and only if $\lambda(G) \leqq 1$. Chapter 9 deals with separability and non-separability and with the tree-like decomposition of a separable (connected) graph into its cut-components, blocks or cyclic elements (depending on the terminological school to which one belongs). Thus one might say that Chapter 9 focuses attention on the distinction between graphs with connectivity $\leqq 1$ and those with connectivity $\geqq 2$. The contents of Chapters 10-12 might be roughly described by saying that they present a somewhat analogous theory in which the important distinction is between graphs with connectivity $\leqq 2$ and those with connectivity $\geqq 3$.

Much of the material included seems to be the product of the author's own research, which the book will help to make more accessible. The book is to be commended for its precision: concepts are exactly defined and theorems are stated exactly and proved exactly, and Professor Tutte thus avoids the sort of intuitive woolliness to which some graph-theorists are too prone. If two further volumes are in fact planned, these, like the present one, will indeed be valuable additions to the literature.

C. ST. J. A. NASH-WILLIAMS

PALEY, HIRAM AND WEICHSEL, PAUL M., *A First Course in Abstract Algebra* (Holt, Rinehart and Winston, 1966), xiii+334 pp., $8.95.

The authors give a lucid account of the topics in abstract algebra normally included in an honours course. Chapters 1 and 3 deal with the basic properties of sets, relations, functions and permutations, while Chapter 2 is devoted to number theory. Chapters 4 and 5 cover the elementary theory of groups and rings. Some more advanced topics in group theory, including the basis theorem for finitely generated abelian groups, the Sylow theory, the elementary theory of soluble groups, and free groups, are treated in Chapter 6, while Chapter 7 is devoted to a similar treatment of ring theory, among the topics covered being field extensions, finite fields, and projective and injective modules.

The first five chapters, together with a selection of topics from Chapters 6 and 7, would make an excellent honours course in abstract algebra.

J. M. HOWIE

CHIH-HAN SAH, *Abstract Algebra* (Academic Press, Inc., New York, 1966), xiii+342 pp., 78s.

As a potential text for a course in a British university, this book falls rather uncomfortably between two stools, containing as it does rather too much advanced material for undergraduates and rather too much elementary material for postgraduates.

The book would, however, make an excellent supplementary reference for a good honours student: it contains a development of elementary number theory from Peano's axioms and a nearly completely algebraic proof of the fundamental theorem of algebra, as well as many other topics of interest to undergraduates and for which there rarely seems to be time.

The scope of the book is enormous. It seems nearly incredible that so much could be packed into 342 pages, and while the style is certainly concise, it does not seem