of mathematical theories in first order predicate calculus. It has long been known that a theory with a finite number of axioms formulated in PC (first order predicate calculus) can be absorbed into PC (it was in this way that the negative solution of the decision problem for PC was deduced from that of a finitely axiomatisable fragment of arithmetic) but it is also known that arithmetic with induction is not finitely axiomatisable. Skolem describes a way of translating a theory with axiom schemata (infinite bundles of axioms) into a theory with finitely many axioms having the same deductive power. The third part of the volume contains six papers on the foundations of arithmetic and analysis. Heyting discusses the descriptive role of axioms in intuitionistic mathematics and gives axiom systems for an intuitionistic theory of vector spaces. Mostowski shows that in weak second order logic (with only *finite* subsets of the set of individuals as values of the second order variables) there is no (finite or recursively enumerable) set X of axioms such that the set of all true formulas in the field of real numbers is exactly the class of consequences of X. Sierpinski (in a paper rather outside the field of this collection) gives a delightfully simple proof that if the numbers m^n, where m and n run through all positive integers, are arranged in increasing order then the difference of consecutive terms is unbounded.

Part IV contains four papers on the philosophy of logic and mathematics, the last of which is a very easy to read account by Hao Wang of such fundamental questions as the reduction of mathematics to logic, the nature of number and existence in mathematics.

R. L. GOODSTEIN

FUCHS B. A. AND LEVIN, V. I., *Functions of a complex variable and some of their applications*, translated by J. BERRY and edited by T. KÖVARI (International series of monographs on pure and applied mathematics Volume 21, Pergamon Press, 1961), 296 pp., 50s.

This book, which is intended for engineers and technologists, is a translation of a book published in Russia in 1951 and is a sequel to one with the same title by B. A. Fuchs and B. V. Shabat which covers the basic theory of functions of a complex variable.

The present volume contains five chapters entitled: I Algebraic functions, II Differential equations, III The Laplace transformation and its inversion, IV Contour integration and asymptotic expansions, V Hurwitz's problem for polynomials. It may be remarked that Chapter IV contains none of the elementary theory of contour integration but is concerned with applications of the inversion formula for the Laplace transform and with the derivation of asymptotic expansions. Chapter V is concerned with the problem of determining conditions under which the zeros of a polynomial should all have negative real parts, and should be particularly useful to workers in stability theory.

Throughout the book there are many worked examples (though there are none for the reader to work out) and the exposition would be very clear were it not for the large number of printer's errors.

D. MARTIN

JEFFREYS, HAROLD, *Asymptotic Approximations* (Clarendon Press: Oxford University Press, 1962), 144 pp., 30s.

In his preface, Sir Harold remarks that great advances have been made in the theory and use of asymptotic approximations during the last few decades. Many of these advances are due to Sir Harold himself, and the reader will find the present monograph a valuable and stimulating account of recent work in this field, written from a very personal point of view. Naturally, in 144 pages, it would not be possible to give a full account of the asymptotic properties of all the special functions. The original papers are usually lengthy and incapable of substantial shortening.

After an introductory chapter explaining the idea of an asymptotic series and showing how these series may be used, the asymptotic behaviour of integrals containing a large parameter is discussed in Chapter 2, the functions log $z!$, $Ai(z)$, $Bi(z)$ being used as illustrations. Chapter 3 deals with the asymptotic solution of a linear differential equation of the second order in the two cases (i) when the independent variable is large, (ii) when a parameter occurring in the coefficients of the equation is large. The methods developed in these two chapters are both applicable to the Bessel functions, which are discussed in some detail in Chapter 4. Other special functions considered are the Confluent Hypergeometric Function and the Parabolic Cylinder Function (Chapter 5) and the Mathieu Functions (Chapter 6), both chapters being rather short.

Although the error committed in stopping at any term in an asymptotic series is of the order of the first term omitted, it is often desirable to get a closer estimate of the error; Chapter 7 contains an account of the author's contributions to this problem.

The last chapter deals with asymptotic solutions of the wave equation.

My only regret is that the book is so short. Many of the topics could have been treated at greater length. But the book is intended to be only an introduction, and a very good one it is.

E. T. COPSON

KURATOWSKI, K., *Introduction to Set Theory and Topology* (Pergamon Press, 1961), 283 pp., 45s.

The book is divided into two parts. The first part is devoted to set theory. It begins with an account of the algebra of sets, including Boolean algebra, and considerable attention is devoted to propositional functions and quantifiers. [Note: in formula (34) on p. 44 the first quantifier on the left should be the universal one.] Additive and multiplicative families of sets are introduced and also Borel families. The power of a set and cardinal numbers including the Cantor-Bernstein theorem are discussed. Ordering relations, well-ordering, ordinal numbers and transfinite induction are fully treated. The treatment of these questions is rigorous and comprehensive without being too detailed and complete in every respect, so that the book is suitable for students beginning a first serious study of the subject.

The second and longer part is devoted to topology. This is developed from the point of view of metric spaces, although references are made to non-metric spaces at various points—for example when bicompactness is introduced, or when the Kuratowski fundamental closure axioms are given. The standard properties of compact and connected spaces are obtained and there are chapters on dimension, elementary homology theory and cuttings of the plane, including the Jordan curve theorem. The author's style is lucid, and he manages to cover a very wide variety of different topics in a comparatively short space. There are numerous exercises for the student, of varying degrees of difficulty. The book will be useful not only as a students' textbook but also as a reference book.

R. A. RANKIN

KURATOWSKI, K., *Introduction to Calculus* (Pergamon Press, 1961), 315 pp., 35s.

This book deserves consideration as one suitable for Honours Mathematics students, who have had a grounding in elementary intuitive calculus. It is concerned wholly with functions of one real variable (functions of several variables are to be treated in a second volume). Comparing it with the classics in the subject, the design and scope of the book is closer to Hardy than to Courant, Goursat or de la Vallee Poussin. The