chapter eight standard results on zeros and poles of meromorphic functions, the theorem of Rouché and the theorem of Hurwitz are proved. The ninth chapter is concerned with light and open mappings on 2-dimensional manifolds. In the final chapter ten the Hurwitz theorem is proved without any assumption about the derivative of the limit function and quasi-open mappings are studied.

EARL J. MICKLE

*Integral equations*. By F. Smithies. Cambridge tracts in Mathematics and Physics, no. 49, Cambridge University Press, 1958. 10+172 pp. $4.50.

This work is devoted to the theory of nonsingular linear integral equations. Most of the book concerns equations with $L_2$ kernels, but many results are stated for continuous kernels, the proofs being given only if they differ significantly from the $L_2$ case. Although the notations of operator theory are used throughout, the results are not presented in the framework of linear spaces. Thus stronger expansion theorems are obtained than would have been possible in the more general formulation.

After a first chapter of preliminaries, Chapter II deals with the resolvent kernel and the Neumann series. The notion of relatively uniform convergence for sequences of $L_2$ functions is introduced in this chapter and is used throughout the book in many of the expansion theorems. For example, the Neumann series for the solution of the linear integral equation of the second kind is shown to be relatively uniformly absolutely convergent. The determinant-free Fredholm theorems are presented in the third chapter. Kernels of finite rank are first studied, and the results are extended by approximation to the general $L_2$ kernel. Chapter IV is devoted to the theory of orthonormal systems. In Chapters V and VI the formula for the solution of the linear integral equation of the second kind in terms of the Fredholm determinants is derived, for continuous kernels in Chapter V, and for $L_2$ kernels in Chapter VI. Hermitian kernels are studied in detail in Chapter VII, and the theory for these kernels is developed independently of the Fredholm theory. Expansion theorems for the kernel and its iterates are given, and the results are used to obtain the solution of the corresponding nonhomogeneous integral equation as an expansion in terms of the characteristic system. Definite kernels are discussed, and a section is devoted to the extremal properties of the characteristic values. The final chapter treats singular functions and singular values, with application to the theory of normal kernels and the theory of linear integral equations of the first kind.

The book serves as an excellent introduction to the theory of integral equations. It is admirably organized and concisely written. No applications are given, except in the first chapter, where the connection with differential equations is sketched. However, this tract should prove a useful reference work for all who employ the theory in such applications.

JOANNE ELLIOTT

*Advanced complex calculus.* By Kenneth S. Miller. New York, Harper and Brothers, 1960. 8+240 pages. $5.75.

This book is intended as an introduction to complex variable theory on a level suitable for juniors, seniors, and beginning graduate students. There are nine chapters, whose headings follow: 1. Numbers and Convergence; 2. Topological Preliminaries; 3. Functions of a Complex Variable; 4. Contour Integrals; 5. Sequences and Series; 6. The Calculus of Residues; 7. Some Properties of Analytic Functions; 8. Conformal Mapping; and 9. The Method of Laplace Integrals.

The book has two nonroutine features: (1) The last chapter, an introduction to a differential equations topic, is included to give an application of contour integration; (2) A discussion of "Riemann axes," a real variable analog of Riemann surfaces, is given to serve as a motivation for the use of these surfaces in the study of multi-valued analytic functions.

The author asserts in his preface that he pays "careful attention . . . to multi-valued functions." But his discussion of "Riemann axes" and of Riemann surfaces remains on a rather vague level. Nothing, for example, is said about whether branch points do or do not belong to such a surface. Also, the domains of single-valued branches of logarithms and powers are rarely mentioned. Indeed, the author's definition of *function* is hardly conducive to clarity: a function in the book is a "rule" which "associates with every point $z$ in $\mathfrak{C}$ [a set of points in the plane] at least one point $w$."

The impact of this book on the student will be the formation of the opinion that complex variable theory is merely a jungle of theorems, many of which lead nowhere in the further development of the theory.

As an example, §7.5 is headed "The Maximum Modulus Theorem." In addition to a statement of this theorem, the section also contains Rouché's theorem, a uniqueness theorem for analytic func-