group theory to organize the material. For instance, the standard properties of the Euler totient appear here as group-theoretic corollaries. The chapter ends with an adequate treatment of the cubic and quartic. The last chapter on the location of roots, both real and complex, is especially detailed. Convergence questions for both Newton's process and for the regula falsi are treated. Contemporary results (with references to live authors) are included in §48 where zeros of complex polynomials are discussed in such a way that the reader is not left with the all too common impression that the subject is embalmed. Although there are no exercises, the text abounds with well chosen examples. The few errors which appear seem to be caught in the errata at the end.

FRANKLIN HAIMO

Handbuch der Laplace-Transformation, Vol. II. *Anwendungen der Laplace-Transformation.* Part 1. By Gustav Doetsch. Birkhäuser, Basel and Stuttgart, 1955. 434 pp. 56.15 Swiss francs.

In this volume the author covers a wide range of applications, many of which might be considered as being applications of the Laplace transform, rather than properties of the Laplace transform, only by fiat. He begins with a collection of results from the first volume (cf. Bull. Amer. Math. Soc. vol. 58 (1952) p. 670), the "rules" for operating with the Laplace transform. Then he takes up a wide variety of connections between the asymptotic expansions of a pair of transforms. Ordinary Abelian and Tauberian theorems were dealt with in the first volume; here it is a question of what can be deduced about one member of a pair of transforms when an asymptotic expansion for the other is given. Much of this material is discussed here for the first time in systematic form, and many old isolated results now appear as special cases of the general theory. Numerous illustrative examples are taken up, for example Stirling's series for log $\Gamma(s)$, Bessel functions, theta functions, and the wave function for the hydrogen atom.

The second part of the volume takes up the connection between Laplace transforms and factorial series (which the author thinks deserve more attention than they have been getting). A number of miscellaneous convergent expansions are also discussed.

The third part deals exhaustively with the use of the Laplace transform to solve ordinary differential equations, first those with constant coefficients on a half line, then those with constant coefficients on a whole line, and finally those with variable coefficients, in so far as the method is applicable to them. Problems about servomechanisms, and electric networks and filters, are used as illustrations and discussed in great detail. The author was a pioneer in the systematic use of the Laplace transform for solving differential equations; although he admits that everything that can be done for a single equation can also be done without the Laplace transform, he defends the technique ably and claims that it is indispensable when systems of differential equations are to be solved. There is probably no better place to read about this technique than in this book: mathematical accuracy is always respected and possible pitfalls are pointed out, while at the same time close contact is maintained with the requirements (and terminology) of the engineer.

Partial differential equations, difference equations, and integral equations are to be dealt with in the third volume.

R. P. BOAS, JR.

Combinatorial topology. Vol. 1. By P. S. Aleksandrov. Trans. by Horace Komm. Rochester, Graylock Press, 1956. 16+225 pp. $4.95.

This is a translation of the first third of Aleksandrov's *Kombinatornaya topologiya* (Moscow-Leningrad, OGIZ, 1947). It consists of the first six chapters preliminary to the formal homology theory, and an appendix. This translated part can be understood by a reader without any specific prerequisite. However a certain amount of mathematical maturity is required of the reader.

Chapter I is a survey of the fundamentals of general topology. Many theorems in this chapter are not used in the sequel. Proofs of such theorems are often omitted, but references are given.

Chapters II, III and V are devoted to a rigorous treatment of geometrically intuitive material. Chapter II presents E. Schmidt's proof of the Jordan curve theorem. The topology of surfaces is developed in Chapter III, where one finds a detailed account of Alexander's derivation of the normal forms of closed surfaces. This chapter on surfaces leads naturally to geometric complexes and related notions, which are introduced in Chapter IV. Chapter V deals with Sperner's lemma and its applications to the Pflastersatz, Brouwer's theorem on the invariance of domain, and the Brouwer fixed point theorem. These chapters II, III and V acquaint the reader with several elementary but important topological facts, and thereby provide an excellent background experience in topology.

The final Chapter VI, of more abstract nature, is an introduction to that part of dimension theory which makes no use of homology theory. Only compact metric spaces are considered. Based on the covering definition of dimension, the chapter begins with the theorem