General topology. By W. Sierpiński. Trans. by C. C. Krieger. (Mathematical Expositions, No. 7.) University of Toronto Press, 1952. 12+290 pp. $6.00.

This book retains many of the characteristics that brought popularity to the author's earlier book, *Introduction to general topology*. However, it has a different axiomatic treatment and is much enlarged so that it could be classified as more than a revision. Readers who have objected to the corruption of the vocabulary and notation of topology by those who have undertaken to rewrite it may find it refreshing to find the way in which such expressions as compact, bicompact, basis, $+$, $\sum$, $\prod$ are used.

Chapter I treats Fréchet (V) spaces, that is, spaces in which each point is associated with one or more subsets called neighborhoods but these neighborhoods need not satisfy any additional conditions. Topological spaces are studied in Chapter II when it is supposed that the neighborhoods satisfy additional conditions. It is of interest that in the cartesian product of topological spaces, a neighborhood is defined to be the cartesian product of neighborhoods. Topological spaces with a countable basis are considered in Chapter III, while Chapter IV treats Hausdorff spaces with such a basis. Chapter V deals with the properties normality and regularity.

An extended treatment of metric spaces is given in Chapters VI and VII. A large part of the study of topology is devoted to the important metric spaces and Sierpiński devotes over one-half of his book to them. In the study of complete metric spaces in the last chapter, particular attention is given to various kinds of their subsets, such as those that are F_σ, G_δ, Borel, or analytic sets. The treatment is more extensive than that in the corresponding chapter of the *Introduction*. The Appendix is much the same as in the *Introduction*.

It is logically satisfying to give a sequence of axioms and definitions and prove theorems on the basis of these without appealing to the intuition. However, such a sequence of axioms may omit some of the spaces that are of interest to topologists. Nevertheless, this book deals with many of the spaces usually studied. A feature that makes it especially suitable as a text is the collection of problems and theorems left as exercises in each chapter.

R. H. BING

Anfangswertprobleme bei partiellen Differentialgleichungen. By R. Sauer. Berlin, Göttingen, Heidelberg, Springer, 1952. 14+229 pp. 26 DM; bound, 29 DM.

This book is concerned mainly with the initial value problems for partial differential equations or systems of equations of hyperbolic type. Many examples from compressible flow and supersonic flow are given as applications of the mathematical theory. Numerical and graphical methods for obtaining solutions are discussed. These include differencing procedures and lattice constructions. The author observes that he did not find it possible to include the recent work of L. Schwartz. He does include an account of Hadamard's theory but not of the results of M. Riesz.

An introductory chapter discusses the classification of linear second-order partial differential equations, the Cauchy-Kowalewski existence theorem, simple examples of the wave equation and its properties as well as difference equations, and applications to gas dynamics and acoustics. The second chapter is devoted to the equation of the first order, which is treated fully, and concludes with the Hamilton-Jacobi equation and applications to mechanics.

The third chapter treats systems of quasilinear differential equations of the first order and the general second-order equation for the case of two independent variables. Many applications are made. The chapter concludes with Riemann's method of integration for the linear second-order equation. In the last chapter the restriction to two independent variables is removed. Most of the chapter is on the linear case. Huygens' principle and the Hadamard theory are given. A number of applications are made.

N. LEVINSON

Inequalities. By H. G. Hardy, J. E. Littlewood and G. Pólya. 2d ed. Cambridge University Press, 1952. 12+324 pp. $4.75.

The second edition of this book differs from the first (published in 1934) by the inclusion of three appendices amplifying a few points of the text. The first gives an elementary proof of the Hilbert-Artin theorem concerning the representation of a strictly positive homogeneous polynomial in several variables as the ratio of two sums of squares. The second gives a proof of the Riesz-Thorin theorem about the convexity of the maxima of bilinear forms. The last proves Hilbert's familiar inequality by the elementary method of maxima and minima.

Unfortunately the first edition of the book was not reviewed in this Bulletin. Clearly, there is not much point in writing a detailed review now when the book has been available to a whole generation of analysts, and a few words of comment may suffice.

In retrospect, one sees that "Hardy, Littlewood and Pólya" has been one of the most important books in Analysis during the last