distracts the reader from the main lines of development. But that is in the nature of the subject, and this book provides a source to which the student may confidently be referred by a lecturer who, owing to the apparently inevitable lack of time, has to omit detail, or even sections of the development. H. G. ANDERSON

RIBENBOIM, PAULO, *Functions, Limits, and Continuity* (John Wiley and Sons, Inc., 1964), vii+140 pp., 45s.

The author has set out to develop analysis from a common sense beginning in a text which demands no specific previous knowledge of mathematics. He has written for students who feel the need of understanding rather than calculating, and he has taken care to motivate and explain all new ideas, and to relate them to everyday intuition. He has restricted himself to a small domain, excluding most of the applications usually taught in a calculus course, to make the book less formidable and also to focus attention on essential principles.

For the most part the author has succeeded admirably in accomplishing his aims. The material is classical, but it comprises just those parts of elementary classical analysis which have motivated modern developments. The outlook and terminology are always modern, and the presentation is generally simple and clear. I would mention particularly the leisurely treatment of the Heine-Borel theorem and its applications at a stage by which many authors have unashamedly stepped up the pace.

The book is literally on functions, limits and continuity; infinite series, for example, are not treated. After a two-page chapter on sets, there are chapters on integers and rationals, construction of reals, points of accumulation, sequences, functions, limits of functions, continuous functions, and uniform continuity. In the first main chapter I felt that the student might be confused by one or two points. The definition of the natural numbers, including the induction principle, is taken for granted in the text, but it should have been pointed out that this was to be discussed in the exercises at the end of the chapter. The real numbers are introduced by Cantor's method, but Dedekind's construction and the axiomatic method are treated in an appendix. A second appendix deals with cardinal numbers.

The layout is excellent, and the print is clear though small. I found singularly few misprints. P. HEYWOOD

BUDAK, B. M., SAMARSKII, A. A. AND TIKHONOV, A. N., *A Collection of Problems on Mathematical Physics*. Translated by A. R. M. Robson. Translation edited by D. M. Brink (Pergamon Press, Oxford, 1964), ix+770 pp., 80s.

This is a translation of a Russian work of the same title, originally designed for use in the Physics Faculty and the external section of Moscow State University. The modest title scarcely gives an idea of the range of the problems selected for discussion. The authors disclaim any attempt to illustrate all the methods used in Mathematical Physics. They omit, for instance, operational and variational methods and generally those depending on integral equations, confining themselves to exemplifying various techniques—separation of variables, integral transforms, source function, etc. for the solution of hyperbolic, parabolic and elliptic differential equations, as used in various branches of mathematical physics. The enunciations of the problems—over 800 in all—occupy the first 158 pages. Solutions, often in summary form, take up 566 pages. This is followed by a " supplement " which includes notes on coordinate systems and some special functions. The list of references at the end consists largely of works in Russian, not all of which are available in English translation; perhaps in a subsequent edition some references to more readily accessible sources could be given.

The problems are arranged under the type of differential equation involved, and consist for the most part of the conventional initial and boundary value problems connected with vibrating strings, bars and membranes, heat conduction and diffusion, electrostatics, elasticity and the like. The index helps the reader to find examples in any of these branches. The solutions are in general concise and clear; occasionally the student may find them somewhat cryptic, as in the few examples of the integral equation method of formulating the Dirichlet and Neumann problems in potential theory; the authors are not to blame for this, for it must be pointed out that the present collection of examples is intended as a companion volume to Tikhonov and Samarski's *Equations of Mathematical Physics*, also available in English Translation (Pergamon Press, 1963, £6), and there is no doubt that the value to the student of the work under review would be enormously increased by a simultaneous study of both volumes.

Prodigious industry must have gone to the compilation of this work, and the student will have a correspondingly Herculean task if he is to master it. He is wisely advised by the authors to attempt only a few problems from each section, and he may take comfort from the reflection that the English edition has been shortened as compared with the original by the omission of " a number of the more uninteresting problems ".

The book will undoubtedly be of great value to anyone following a systematic course on " mathematical methods "; but not many students are likely to be able to afford to buy it as well as the main work which it is designed to supplement.

The translation reads well, and the paper and printing are excellent; only half a dozen minor misprints have been noticed. R. SCHLAPP

HAYES, CHARLES A., JR., *Concepts of Real Analysis* (John Wiley and Sons Ltd., 1964), vii+190 pp., 49s.

This book is intended to give an understanding of the real number system, and the fundamental limit processes associated with it, to students who have completed a course in elementary calculus. It was developed from a summer course for schoolmasters who have to teach calculus and need to understand what lies behind it.

The first of the seven chapters gives a leisurely introduction to set theory, just the notation, unions and intersections, ordered pairs, the definition of a function in terms of ordered pairs, inverse functions and the axiom of choice. In the second chapter, on number systems, no attempt is made to construct the real numbers, but their basic properties are listed in the form of axioms. The well-ordering principle, the Archimedean property, a discussion of integers and rationals, and the upper bound axiom are included in this chapter. It is followed by one on finite and infinite sets, in which the rationals are shown to be countable; cluster points and cardinal numbers are introduced, but the latter are defined only for finite sets.

In the early chapters the level of the presentation is well chosen, though I began to feel in Chapter 3 that too much space was being given to proving things which most readers would readily accept, for example, that a finite set has a largest member. I felt also that the proof of the Bolzano-Weierstrass theorem could have been presented more simply if the author had not insisted on using set notation.

Chapter 4 is on sequences, and in Chapter 5 many of the previous notions are extended in a rather painstaking way, to the system consisting of the real numbers together with $+\infty$ and $-\infty$. By this time the author's obsession for set notation is making the treatment unnecessarily heavy. He devotes half a page to explaining the term *subsequence*, and a further nine lines to the proof that a subsequence of a subsequence of a given sequence A is a subsequence of A. He never hesitates to replace a standard abbreviation by a more complicated expression in set notation; thus the