of strengthening or weakening the constraints. Two thorough chapters on the Dual Problem and the Transportation Problem, and one on more advanced topics including integer programming and quadratic programming, complete the book.

The general impression is that the author has a good grasp, not only of his subject, but also of his reader's needs. He is careful in the way he introduces new notation and ideas, as they afford an insight into the problem. Just occasionally—and perhaps this is endemic in the material—this admirable plan misfires slightly, for example, at one or two points in the theoretical treatment of the Simplex method, and one feels that perhaps some insight into the mathematics would help. This is a commendable book, and one which, in large measure, can be used as a self-tutor, if need be. It includes a comprehensive bibliography of basic texts and research papers; this is entirely appropriate, as it is the author's intention to fit his readers for a confident excursion into such material. J. A. OGDEN

MANSFIELD, MAYNARD J., *Introduction to Topology* (University Series in Undergraduate Mathematics, D. Van Nostrand Co. Ltd., 1963), ix+116 pp., 21s.

This short textbook is designed to cover the subject matter of a first course in point-set topology. After an introductory chapter containing an informal account of the algebra of sets, the second chapter begins with a skilful explanation of why topology has to do with continuity. The reader is then gently led to the open-set definition of a topological space, and through the usual definitions and properties of neighbourhoods, closure, continuous mappings and the like. After that, there is a chapter each on connectedness and compactness. The next chapter briefly introduces regular, normal and completely regular spaces and the last chapter is on metric spaces.

In keeping with his aim to make the book suitable for a short introductory course for undergraduates, the author has clearly chosen to restrict the contents to an essential minimum and has been at great pains to introduce new ideas only where they are needed. Thus, for example, locally compact spaces appear in the exercises but not in the text. It may perhaps give some idea of the scope of this book to indicate that probably the two hardest theorems proved are Urysohn's Lemma and the theorem asserting that every metric space has a completion (with which the book ends). These, and indeed all the theorems, are proved carefully, clearly and fully. The book as a whole has a pleasing style that is easy to read. The concepts introduced are illustrated by more than fifty examples and there are over two hundred exercises, most but not all of them being fairly easy applications of the results proved in the text.

This is a book that could be read by students of fairly modest mathematical attainment. It would give them a good idea of the basic concepts and results of analytic topology and would leave them prepared, and also encouraged, to go on to further study. A. P. ROBERTSON

COHEN, L. W. AND EHRLICH, G., *The Structure of the Real Number System* (Van Nostrand, 1963), viii+116 pp., 33s.

Most students, in their undergraduate courses, meet some part of the development of the number system, but there can be few who have traced it in detail from Peano's axioms for the natural numbers, through the integers, the rationals, and the reals (as equivalence classes of sequences) to the complex numbers. This book provides a detailed guide up these steps.

The necessary preliminaries, in the fashionable Chapter 0, consist of a knowledge of the relevant parts of Set Theory, condensed into fifteen pages, hard going for those without a previous acquaintance with the subject. Indeed the whole book would make hard reading without guidance, since the careful attention needed for all the detail

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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.

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