
The authors' intent is "to teach students the tools of modern analysis as it relates to further study in mathematics, especially statistics, numerical analysis, differential equations, mathematical analysis and functional analysis, ... The key to a sound foundation for the study of analysis lies in an understanding of the limit concept", and accordingly, after initial chapters on sets and the real number system, they introduce the limit concept using numerical sequences (Chapter IV) and series (Chapter V), and then treat limits and continuity of real-valued functions of a real variable (Chapter VI), metric spaces (Chapter VII), differential calculus of the real line (Chapter VIII), Riemann-Stieltjes integration (Chapter IX), and sequences and series of functions (Chapter X). Subsequent chapters treat the exponential, logarithmic and circular functions (Chapter XI), inner product spaces and Fourier series (Chapter XII), normed linear spaces and the Riesz representation theorem (Chapter XIII), and the Lebesgue integral (Chapter XIV). The first seven chapters could be used for a one-term course on the concept of a limit.

A particular strength of the book is the exercises, which should be of significant value in teaching the subject to average students.

There have been elementary analysis textbooks in English at least since 1908, when Hardy wrote *A Course of Pure Mathematics* in the style of "a missionary talking to cannibals", and by 1954 Hermann Weyl, addressing the Amsterdam International Congress of Mathematicians, could speak of "the circle of classical analysis, where every mathematician is at home". Since 1908 other parts of pure mathematics, such as abstract algebra, have achieved a status comparable to classical analysis, so that the title of Hardy's book is no longer appropriate, and excellent
textbooks have appeared which make other subjects such as abstract algebra accessible to any student with a moderate amount of mathematical ability. However, despite having been part of the pure mathematics curriculum for so long, analysis still causes severe difficulties to many students. These difficulties stem from failure to achieve a sound understanding of the limit concept, and in the reviewer's experience there is still a lack of textbooks which are really effective in helping students to master the notion of a limit. Among the 33 books listed as references on page 410 of the book under review is K.A. Ross's recent *Elementary Analysis: The Theory of Calculus*, (Springer, New York, 1980). This book is worth considering as a text for a first course in mathematical analysis, but is pitched at a lower level than the present book. On the other hand W. Rudin's *Principles of Mathematical Analysis* (3rd edition, McGraw-Hill, New York, 1976) is pitched at a rather higher level than the book of Johnsonbaugh and Pfaffenberger. Hardy's book, despite many admirable features, is now too old to meet the needs of today's students, and few of the other texts listed are at all suitable. Thus this book of Johnsonbaugh and Pfaffenberger appears to occupy a rather surprising gap in the textbook literature.

In the reviewer's opinion, it would be unfortunate if W. Kaplan's recent unfavourable review in the American Mathematical Monthly (vol. 89 (1982), p. 708), were to prevent this book from receiving the consideration which it deserves. Kaplan's criticism is directed particularly against the authors' choice of topics: for instance, the omission of line integrals, multiple integrals with the formula for change of variables, Green's theorem and Stokes' theorem. In his opinion, "it is better to yield some on rigor" in order to ensure that the student is exposed to such topics as geometric analysis which belong to the general education of mathematicians. Few mathematicians would disagree with Kaplan about the importance of these topics and ideas, and university curricula now frequently provide for such topics to be taught in separate courses at a lower level of rigour. However, there is still
a need for courses in which analysis is studied at the level of rigour found in this book, and as a text for such courses, the reviewer feels, many teachers would find it more suitable than any other at present available.

In the Cumulative Book Index for June 1981 this book is listed with a price of US$24.50. At a price of this order, it would seem to deserve a place on the analysis teacher's bookshelf, and serious consideration for class use.

J.A. Kalman