which is a parabola, a rectangular hyperbola and an equiangular spiral? Did undergraduates in 1907 really believe that there are points at infinity which lie on a line and that, if you could get there, you would find $1=0$? His interest in games is shown by notes on batting averages at cricket (Jack Hobbs was one of his idols) and about match and medal play at golf. There is also a hint of another of his interests, a reference to Agatha Christie's thriller "The Murder of Roger Ackroyd".

The research papers are devoted to Fourier Transforms, Integral Transforms and Integral Equations. It was not until 1918 that the words "integrable in the sense of Lebesgue" appear. Before then, Hardy, like Hobson and other English writers, used the word "summable", which had to be discarded because it was needed in the theory of summability of divergent series and integrals. Then follow 80 pages of miscellaneous papers on such varied topics as set theory, differential equations and genetics.

Amongst the addresses and invited lectures are two about Ramanujan and an excellent "Introduction to the Theory of Numbers" from the *Bulletin of the American Mathematical Society.* There is also his famous attack on the Mathematical Tripos, his Presidential Address to the Mathematical Association in 1926. "I do not want to reform the Tripos, but to destroy it." I should like "to give first classes to almost every candidate who applied; to crowd the syllabus with advanced subjects, until it was humanly impossible to show reasonable knowledge of them under the conditions of the examination." Did he really believe this? At any rate, six of the twelve obituary notices are about men who were trained under this system. A student of the history of mathematics in this century would find the obituary notices and book reviews of great interest.

Hardy's development as a mathematician is well illustrated by his contributions to *The Educational Times and Journal of the College of Preceptors*, a monthly journal devoted to educational matters. Each issue contained mathematical problems posed by contributors and solutions by the proposers and others. He set his first problem in 1898 whilst still an undergraduate and continued to contribute until the journal died at the end of the 1914–18 war. This first problem was "Give in a symmetrical form the general equation of a circle through two fixed points". His second asked for the coordinates of the vertex of the parabola inscribed in the triangle of reference, given that the focus is $(\alpha', \beta', \gamma')$ in trilinear coordinates. Most of his problems were concerned with evaluating complicated definite integrals. His first interest in the summability of divergent series appeared in 1899; his problem was to sum the divergent series

$$\sum_0^\infty \frac{(-1)^n(n+1)}{4n+1}.$$

His last contribution in 1917 was geometrical; he found the extraordinary formula

$$ds^2 = (dn^2\alpha - dn^2\beta)(d\alpha^2 - d\beta^2)$$

for the line element on a sphere of unit radius.

Although he was an analyst, he became Savilian Professor of Geometry at Oxford in 1919. He took his duties seriously and gave very interesting lectures to undergraduates. His views on "What is Geometry?" are clearly expounded in his 1925 Presidential Address to the Mathematical Association. It may suprise people to know that he gave a course of lectures on Relativity, and told us with glee that the Riemann–Christoffel Tensor had appeared as a clue in an American thriller.

There is no more I can say. I greatly enjoyed reading this volume because Hardy gave me my introduction to real mathematics.

E. T. COPSON

McBride, A. C. *Fractional Calculus and Integral Transforms of Generalized Functions* (Research Notes in Mathematics 31, Pitman, 1979), 179 pp., £7·50.

This book is concerned with the study of certain spaces of generalized functions and their application to the theory of integral transforms defined on the positive real axis. Dr. McBride has purposely chosen to study only a few operators in considerable detail rather than hurriedly rushing over a larger number of transforms for which his results are applicable, and has used as a unifying theme the operators of fractional integration. A major contribution of the author is to construct spaces of generalized functions which are applicable to several different operators at the same time instead of having to change spaces each time the operator is changed. This is of crucial importance in almost all cases of practical importance since in such cases it is usually necessary to apply a succession of operators in order to arrive at a solution. The plan of the book is as follows. In Chapter Two the basic spaces of testing functions and generalized functions are introduced and their algebraic and topological properties studied. Chapter Three is devoted to the development of the operators of fractional integration defined on the previously studied space of generalized functions and in Chapter Four these results are applied to certain integral equations having a hypergeometric function as the kernel. Chapters Five and Six are concerned with the Hankel transform defined on spaces of generalized functions and the close connections existing between this transform and fractional calculus. Chapter Seven is in a sense the highlight of the book where the material in Chapters Three, Five and Six is applied to the study of dual integral equations of Titchmarsh type. In particular, the author is able to establish the existence and uniqueness of classical solutions to such a system. The uniqueness part of the argument is particularly elegant and employs the full power of the previously developed theory. Finally, in Chapter Seven, the author briefly indicates how his methods can be used to study other classes of integral operators defined on $(0, \infty)$.

Dr. McBride has made strenuous efforts to develop his theory as concisely as possible and not to wander off in tangential directions. His aim of showing "how the general theory incorporates the classical theory and, at the same time, provides a framework wherein the formal analysis found in many books and papers can be justified rigorously" has been admirably fulfilled in a clear and lively style. The author has stated in his preface his hope that this book might serve as a modest tribute to his thesis advisor, the late Professor Arthor Erdélyi. In terms of subject matter, significance of results, and excellent use of the English language, the book of Dr. McBride fulfills the highest standards set by his mentor and his "modest tribute" is in fact a major contribution to the area of mathematics in which Professor Erdélyi devoted much of his mathematical life. It should occupy a prominent place on the bookshelf of every mathematician interested in classical analysis and its applications.

DAVID COLTON

BLYTH, T. S., *Module Theory: An approach to Linear Algebra* (Oxford University Press, 1977), £9·50.

The titles of the two parts into which this book is divided, namely "Modules and vector spaces" and "Advanced linear algebra", give a good idea of the contents. As the author states, a standard course on groups, rings and fields is all that is needed as background. In some respects, Professor Blyth has his own notation which, though logical and consistent, is by no means universal. So the most useful introductory book to use with this volume is the author's own "Set theory and abstract algebra" (Longman Mathematical Texts, 1975). Given this background there is material here for two good courses, one on module theory leading to vector spaces, the other on advanced linear algebra.

The first part starts with the basic definitions of modules. Vector spaces are exhibited as a special case. The treatment has a homological flavour: we are introduced to morphisms, commutative diagrams, products and coproducts, etc. The topics covered include submodules, quotient modules, chain conditions and Jordan–Hölder towers, free modules, bases, matrices, linear equations and inner product spaces. This forms a good introductory course on module theory with an emphasis on the applications to linear algebra.

The second part continues in a similar vein. We learn about injective modules, tensor products of modules and tensor algebras. Determinants are introduced in their natural setting, namely exterior powers. This book finishes with two major applications. The first is the decomposition