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

https://doi.org/10.1017/S0013091500006507 Published online by Cambridge University Press

theorem for a finitely generated module over a principal ideal domain. The second gives the canonical forms for a matrix under similarity transformations. Building on the first half of the book, this part covers all the ground that might be expected in an advanced linear algebra course.

Both sections of the book are well-designed to serve as courses for honours undergraduate or first year graduate students. There are a number of exercises at the end of each chapter, which would be useful for the lecturer, and which extend many of the results from the text. Together with the author's introduction to abstract algebra mentioned earlier, we have here a very good basic algebra course, with a modern flavour. Most students reading for a mathematics honours degree will have done a linear algebra course before meeting abstract algebra and module theory, and so may well be familiar with some parts of the applications of module theory mentioned in this book, particularly in the first part. But the overlap is likely to be small and will serve to anchor the theory to some familiar situations.

Anyone intending to give a course on module theory or advanced linear algebra would do well to consider seriously whether to use this text. It is a useful book to have on one's shelves, and should be in all libraries, even in the present financial climate. The book is reproduced directly from typescript, which I always feel makes it look rather untidy. But this is a small price to pay for keeping the cost down. There are a number of misprints, fortunately mostly not too serious.

J. D. P. MELDRUM