BOOK REVIEWS

KRA, IRWIN, *Automorphic Forms and Kleinian Groups* (Benjamin, 1972), xiv+464 pp.

This book is an account of some impressive recent developments in an active area of complex analysis, namely the structure theory of Kleinian groups (groups of linear fractional mappings which act discontinuously on an open subset of the complete sphere). Two major results, Ahlfors' finiteness theorem and Bers' area inequalities, are treated; the theory the author develops to establish these results also enable him to obtain classical results on compact Riemann surfaces (including the Riemann-Roch theorem) as well as the relatively recent analogous theory for open surfaces (Behnke-Stein, Weierstrass, Mittag-Leffler and other theorems).

The author assumes a familiarity with elementary properties of Riemann surfaces and some basic facts about Kleinian groups. The topological classification of compact surfaces, and basic L^p theory, are also assumed.

The tools developed by the author include existence theorems for automorphic forms and the theory of Eichler cohomology groups of Kleinian groups. Bers' approximation theorem (Chapter 4) is also of independent interest (this concerns L^1 approximation of analytic functions on an open plane set by rational functions).

As the author states, his material has been selected according to personal preference and some important relevant topics are not included (for example, quasi-conformal mappings are not treated). However, the book is a stimulating introduction for anyone contemplating research in this field.

A. M. DAVIE

KRALL, ALLAN M., *Linear Methods of Applied Analysis* (Addison-Wesley/Benjamin, Reading, Massachusetts, 1973), $16.00 (cloth), $9.50 (soft cover).

This is an interesting book, both for the contents and for the mode of printing.

The book is a systematic account of certain topics in linear analysis which are of fundamental importance in modern applied mathematics. Basic topics considered are Banach and Hilbert spaces; the Stone-Weierstrass theorem; linear ordinary differential equations and existence theorems; special functions; Lebesgue integral; an introduction to partial differential equations; distribution theory. These results are then applied to the study of a number of boundary value problems; these include both the regular and singular Sturm-Liouville problems; Laplaces's equation; the Heat and Wave equations.

This is a well organised book and there is much to interest the applied mathematicians, and theoretical physicists and engineers. In some places the pure mathematician would wish for a more accurate statement of some of the results, but here the author may have looked for making some economies in his presentation.

In the United Kingdom the book is likely to be beyond the reach of most Honours degree courses in mathematics. However it should be a very useful text for postgraduate students, particularly those working in the theory and application of differential equations and boundary value problems.

Some comment is called for on the printing of the book. This is a direct photo-offset from the typed manuscript; the book has not been set in normal mathematical type. Within the restriction imposed by a standard typewriter the typist, who is named by the author in the introduction, has performed a very creditable task in typing up the original manuscript. Inevitably, however, there are some bizarre results (some due to the author's insistence on exponential e instead of exp [...]); see for example pages 71; the bottom line on page 105; the matrix formulae on page 256.

Clearly such production methods make for economies in one direction; the cost of setting the book in mathematical type is avoided. However it also makes for additional costs in another way; it is a reasonable estimate that this particular book of 700 pages could have been produced in 500 pages, or less, with the traditional form of mathematical printing. It would be interesting to have a comparison made of the production costs of this book under review and a similar book produced in the more traditional form.

However, let not these comments detract from the book itself. The author has produced an important text which will be helpful to both pure and applied mathematicians.

W. N. EVERITT

YAU-CHUEN WONG and KUNG-FU NG, *Partially Ordered Topological Vector Spaces* (Clarendon Press, Oxford, 1973), ix + 217 pp.

The initial problem facing the writer of a book on this subject is what to do about linear lattices, alias Riesz spaces. These have a distinctive theory of their own, occupying a position within the general theory that might be compared to that of Hilbert spaces within Banach space theory. The authors' choice (in the reviewer's opinion, a good one) is to deal with them separately, devoting roughly the first half of the book to the general theory and the second half to linear lattices. Each half is divided, unequally, into nine chapters, starting with one on the purely algebraic structure.

The general theory has now reached a relatively satisfactory state, with duality playing a central part, and this account is both timely and welcome. A good deal of it has appeared in earlier books, but two notable recent developments (for which the authors have been largely responsible) are included, namely (i) the theory of locally solid spaces, now seen not to require a lattice ordering, and (ii) the completed duality theory of base norms and approximate order-unit norms.

The theory of linear lattices is much harder to collect into a manageable form, and the authors' choice of material is necessarily rather personal. To start with, the possibilities of a purely order-theoretic development, without topology, are immensely greater. This has been treated in detail by Luxemburg and Zaanen, and the present authors, in accordance with their title, do not explore far in this direction. Instead, they concentrate on (i) theorems relating order-completeness and topological completeness, and (ii) duality theory, finishing with four short chapters outlining their own work on order-infrabarrelled spaces.

The reviewer was surprised to find no mention of extremal structure, with its applications to lattice homomorphisms and M-spaces. Less surprisingly, there is no attempt to describe the theory of positive operators.

The proofs are complete and the style is always clear, though a clear head for notation is required, and there are not many concessions to motivation. A quite elementary knowledge of topological linear spaces will see the reader through most of the book. The attributions in the text, on the authors' own admission, are not systematic or accurate, but are amplified by some notes at the end.

G. J. O. JAMESON