MADDOX, I. J., *Elements of Functional Analysis* (Cambridge University Press, 1970), x+208 pp., £2.50.

The purpose of this book is to provide a readable introductory course on functional analysis for undergraduates who have completed basic courses on real and complex analysis. The first chapter is introductory. The basic concepts of set and function are discussed, results on real and complex analysis are recalled, and some inequalities are proved. Chapter 2 is concerned with metric and topological spaces. The standard topological notions are developed in the metric space setting. Also there are sections on topological spaces, the contraction mapping principle and the Baire category theorem. In Chapter 3, topological linear and linear metric spaces are studied. There is a section on bases in vector spaces, and a brief introduction to the theory of distributions is given. Chapter 4 is concerned with normed vector spaces. The Hahn-Banach theorem, the open mapping and closed graph theorems, and the uniform boundedness principle are covered, and applications are given. Chapter 5 provides a brief introduction to the theory of Banach algebras. The Gelfand-Mazur theorem is obtained. Also a weak and not particularly useful version of the Gelfand representation theorem is proved. Chapter 6 contains a standard introduction to the geometry of Hilbert space. The final chapter is concerned with summability theory, the author's personal research interest. The theorems of Silverman, Toeplitz and Schur are proved, and various methods of summability of sequences by infinite matrices are discussed. The book concludes with 41 problems (solved and unsolved), mainly on the contents of the last chapter. Generally speaking, the book succeeds in its modest aims. There are numerous examples and a wide variety of exercises in the text. Also the printing is of the high standard we have come to expect from Cambridge University Press. However, there is very little new material in the first six chapters of the work. Also most of the examples in the text pertain to sequence spaces. This, together with the last chapter, might create the unfortunte impression that summability theory is one of the main areas of research in functional analysis. The reviewer is of the opinion that a chapter on the theory of linear operators on Hilbert space would have been more appropriate than Chapter 7, in an introductory text.

H. R. DOWSON

LEECH, JOHN (Editor), *Computational Problems in Abstract Algebra*, Proceedings of a Conference held at Oxford under the auspices of the Science Research Council Atlas Computer Laboratory (Pergamon Press, Oxford, 1970), £7.

The volume contains thirty-five articles by some of the world's leading experts on the use of computers in abstract algebra. The first paper, by J. Neubüser, on *Investigations of groups on computers*, gives a very readable survey of a wide variety of problems. Most of the subsequent papers are on more specialised problems and more than half the volume is taken up with group theory. The other branches of algebra represented include semigroup theory, Jordan algebras, Galois theory, knot theory and algebraic topology. Apart from the interest of the individual articles it is useful to have available in a single volume the most recent numerical results. This is a rapidly moving field and several improvements have been made and new results have been found since the conference was held; some of these have been incorporated or added in proof.

R. A. RANKIN

CRAMÉR, H., *Random Variables and Probability Distributions* (Third Edition, Cambridge University Press, 1970), vi+118 pp.

This classic Cambridge Tract is not quite as indispensable as it was for many years following the publication of the First Edition in 1937, since much of the ground

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which it covers is now contained in other books on probability. However it is still an excellent introductory book to the Central Limit Theorem.

The main difference in this the Third Edition is that Liapounoff's inequality for the remainder in the Central Limit Theorem has been replaced by a sharper one due to Berry and Esseen.

S. D. SILVEY

REID, CONSTANCE, *Hilbert* (Springer Verlag, 1970), 290 pp., 75s.

This is an eminently readable biography, based on letters, extensively quoted, and on the recollections of many of Hilbert's former pupils and associates, with just enough mathematical commentary to give the story coherence. The book concludes with a reprint of H. Weyl's article in *Bull. Amer. Math. Soc.* **50** (1944), 612-654, giving a fuller account of Hilbert's contributions to invariants, number fields, axiomatics, integral equations and mathematical physics.

The author's sympathetic and authentic portrait of Hilbert in the setting of continental mathematics from the 1880's up to his death in 1943 goes far to explain the enormous influence which his unique personality no less than his mathematical work have had on subsequent developments.

R. SCHLAPP

KAPLANSKY, IRVING, *Commutative Rings* (Allyn and Bacon, Boston), x + 180 pp., $10.95.

The book is essentially an expansion of the notes which appeared under the same title in the Queen Mary College Mathematics Notes series, the major difference being that the author reverts to a traditional definition of regular local rings. No attempt is made to achieve completeness, the text consisting of a number of selected topics reflecting the author's preferences and prejudices; in particular primary decomposition is omitted. Supplementary material is contained in the numerous exercises of varying difficulty, some with hints, which occur regularly throughout the book. Conciseness is attained by a careful use of short crisp sentences which simultaneously create an impression of enthusiasm making the work highly readable. Quick reference is facilitated by the extremely attractive presentation. Although there are a number of misprints, mainly towards the centre of the book, these are not likely to confuse the reader.

The first three chapters require the reader to have only an elementary knowledge of rings and extensions of fields. Among the topics covered are the Hilbert Nullstellensatz, localisation, prime ideals in polynomial rings, prime ideals in integral extensions, Prüfer domains, Bézout domains, valuation domains, the Hilbert basis theorem, the Krull intersection theorem, Dedekind domains, rank and grade of ideals, Macaulay rings, the principal ideal theorem and regular local rings.

The fourth chapter is designed to be read in conjunction with part III of the author's " Fields and Rings "; even so a greater number of cross-references would be desirable. For example, the freeness of projective modules over local rings should be noted at its first application and the meaning of " minimal " in " minimal short FFR " should be explained. Admittedly reference to other sources becomes necessary upon the introduction of the long exact sequence for Ext but it does seem unnecessary for the author to refer to one of his papers for a proof of a result in the main text which could have been included so easily. Topics covered in the fourth chapter include unique factorisation in regular local rings, the Euler characteristic of an FFR, injective dimension and Gorenstein rings.

D. B. WEBBER

Brief Mention

COPSON, E. T., *An Introduction to the Theory of Functions of a Complex Variable* (Clarendon Press: Oxford University Press, 1970), viii + 448 pp., 30s. paper bound.

This well-known introduction to complex variable theory is now available in a paper-covered edition which will enhance its continued usefulness to students.

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