value larger than the largest number in one's computer ". Discrete analogues are provided in the early chapters for energy and momentum conservations for particle mechanics and in later chapters the same basic principles are used in order to model shock waves, heat diffusion, elastic phenomena and even turbulence in the mixing of fluids. At the very end of the book the author lists 23 further research problems in which he invites the reader to adapt and develop the methods of the text.

There are also disadvantages, some of them serious, in this formal reliance on the discrete approach. For one thing, the precise form of discretisation has to be carefully chosen, both for stability reasons and for comparison with equivalent " continuous " properties. As an example, the differential equation representing the simple harmonic oscillator is replaced on p. 29 by the relation $F_k = -\frac{1}{2}\omega^2 (X_{k+1}+X_k)$ where X_k is the position at time t_k and F_k is the force acting on the particle at that time. In this form a potential energy V_k can be defined such that K_k+V_k is the same at all time steps t_k, K_k being the kinetic energy of the particle at time t_k. But if the more natural choice of $F_k = \omega^2 X_k$ were made, no such equivalent of this energy conservation law exists. The author is clearly well aware of this problem and discusses the various alternative forms of discretisation in Chapter IX. It would seem, however, that such examples serve to emphasise the reliance indirectly placed on the continuous model whose formulation involves differential and not algebraic equations and thereby cast some doubt on the scientific merits of the assertion that discrete measurement of physical phenomena should logically lead directly to a discrete model formulation. Again, the attempt to model a gas as in Chapter VII by a finite number of particles subject to some mutually repulsive law and to calculate each particle's motion by the laws of Newtonian mechanics is undoubtedly interesting, but one is bound to note the limitations, even with the most powerful computer, and to wonder whether it contributes anything significant to one's understanding of the mathematical principles of gas dynamics.

The book is produced by a photo-offset process from an original typed manuscript. It has been carefully and accurately done (one or two minor errors were noted but not many) but with the range of symbols needed it is difficult to avoid the conclusion that in a book such as this there is no real substitute for the professional printer's armoury of type and general expertise. A small but irritating feature is the shape of the comma, which, when it occurs after a symbol with a subscript as it frequently does, makes it appear that the subscript has a prime on it. Only from p. 96 on, where genuinely primed subscripts appear for the first time, can one see the difference.

Despite these shortcomings, there is much thought-provoking material in this book which ought to tempt workers in various fields of mathematics, especially applied mathematics, to add it to their libraries. Not all will agree with the author but most will find his presentation interesting and refreshingly different from more conventional approaches.

A. G. MACKIE

LANG, SERGE, *Elliptic Functions*, (Addison-Wesley/W. A. Benjamin, Inc., 1974), xii + 326 pp., $17.50.

Most recent books on elliptic functions (Tricomi, Neville, etc.) treat the subject from the point of view of complex analysis. Not so the book under review which explores ramifications in arithmetic, algebra, and algebraic geometry. Elliptic integrals and the problem of inversion do not fall within the scope of the book which concentrates on elliptic curves, their parametrisation, homomorphisms, isomorphisms, and other algebraic properties. Characteristically enough, there is no item in common in the list of books and monographs given in the present work, and the list of references in the National Bureau of Standards' " Handbook of mathematical functions ".

https://doi.org/10.1017/S0013091500015625 Published online by Cambridge University Press

The 22 chapters of the book are grouped in four Parts entitled respectively General theory ; Complex multiplication ; Elliptic curves with singular invariants ; Elliptic curves with non-integral invariant ; Theta functions and Kronecker limit formulas.

The author has performed a notable service by summarising modern developments in the field covered by his book and achieving some simplification in the process.

A. ERDÉLYI

JAMESON, G. J. O., *Topology and Normed Spaces* (Chapman and Hall, London, 1974), xv+408 pp., £3·80 (soft cover), £5·80 (hardback).

This book has developed out of lectures given by the author at the universities of Warwick and Innsbruck. The only formal prerequisities are elementary analysis and some linear algebra. As the title indicates the book is divided into two main sections, Part I on Topology and Part II on Normed linear spaces. Part I contains subsections on basic concepts, metric and normed spaces, separation properties, connected sets, bases of open sets and countability axioms, complete metric spaces, compactness, Urysohn's lemma and the Tietze extension theorem, product spaces and Cantor spaces. Part II contains subsections on linear mappings and functionals, dual spaces, finite-dimensional spaces, convexity, Hahn-Banach theorem, uniform boundedness theorem, open mapping theorem and closed graph theorem, spaces of continuous functions, weak topologies, Tychonoff's theorem, Hilbert spaces and compact linear mappings. There are also five subsections of Part II which reflect the author's personal interests. These are entitled Complemented subspaces, Bases, Unconditional convergence, Linear lattices, and The duality of pairs of subspaces. There are short appendices on Countability and Zorn's lemma, a comphrehensive bibliography and an index. Each subsection contains a set of exercises of varying degree of difficulty. The book is very well written and should prove extremely valuable both to undergraduates and to those teaching undergraduate courses in topology or functional analysis.

H. R. DOWSON

RILEY, K. F., *Mathematical Methods for the Physical Sciences* (Cambridge University Press, 1974), xvi+533 pp., £8·75 (cloth), £3·95 (soft cover).

This book, subtitled " An informal treatment for students of physics and engineering ", covers preliminary calculus (revisionary), vector algebra and calculus, ordinary differential equations, Fourier series and transforms, partial differential equations, numerical methods, calculus of variations, eigenvalue problems, matrices, tensors, and complex variable theory.

The author acknowledges that he is aiming at the " average student ", and so he prefers descriptions in words to compact symbolism, and for the same reason avoids notation like u_{xy}, preferring to write the expression out in full. The plan for each section is to motivate the problem and explain the solution idea in words, present the formal mathematics, and then illustrate the method by means of an example, often a physical one. The reader is expected to help in the development by performing part of the routine manipulation himself (hints are provided at the end of the book). There is also a large collection of exercises at the end of each chapter, with solutions to all of them.

On the whole this scheme seems a most successful way of getting across the concepts and the techniques involved. The only drawback is that in some of the explanations difficulties are skated over in a way which could cause misunderstanding, for example, the rôle of boundary values in superposition methods for solving differential equations,

https://doi.org/10.1017/S0013091500015625 Published online by Cambridge University Press