BOOK REVIEWS

LANG, SERGE, *Complex Analysis* (Addison-Wesley, 1977), xi+321 pp., £12·00.

This book is intended as a text for a course on complex analysis at the advanced undergraduate level. It is in two parts. The first part contains all the material which is covered in a first course on complex analysis: namely, power series, Cauchy's theorem and consequences, calculus of residues, conformal mapping and harmonic functions. Cauchy's theorem is proved by Artin's method. However the text contains a section giving the more recent proof due to Dixon. A novel feature of the book is a proof of the Jordan canonical decomposition of a matrix by contour integration. The second part contains more advanced topics: applications of the maximum modulus theorem, Weierstrass's factorisation theorem, Mittag-Leffler's theorem, elliptic functions, the gamma function, analytic continuation, the Riemann mapping theorem and the little Picard theorem.

The book is concisely and well written. The exercises are numerous and varied. I would strongly recommend this text to Honours students pursuing a course on complex analysis.

H. R. DOWSON

FIORINI, S. and WILSON, R. J., *Edge Colourings of Graphs* (Research Notes in Mathematics 16, Pitman, 1977), 154 pp., £6·50.

The theory of edge-colourings of graphs can be considered to have begun in 1880, when P. G. Tait, Professor of Natural Philosophy at Edinburgh, proved that the famous four-colour theorem (on *vertex*-colourings of planar graphs) was equivalent to a three-colour theorem on colouring the *edges* of cubic maps. Apart from a few contributions from König, Shannon and others, little progress was made in the theory until Vizing published a series of papers in the 1960s. Since then there have been many papers on the subject, and this very readable book is the first attempt to gather together all the known results in one place. Robin Wilson needs no introduction as an expositor of graph theory. Stanley Fiorini studied under him at the Open University, and his doctoral thesis, "The chromatic index of simple graphs", won him the first Open University Ph.D. in pure mathematics. Together, the two authors present a very readable survey of the subject, with a clear statement of what the open problems are.

The basic problem is to determine how many colours are needed to colour the edges of a graph so that no two incident edges have the same colour. Clearly, if ρ is the maximum valency of the vertices of a graph G, then G requires at least ρ colours, and the fundamental theorem, due to Vizing (1964), asserts that the number of colours required is always ρ or $\rho+1$. Since then, the main direction of research has been to classify all graphs relative to this theorem. Those which need only ρ colours are said to be of class one, and the rest are of class two. For example, all bipartite graphs are of class one, and complete graphs K_n are of class one if and only if n is even. The search for class two graphs is assisted by the study of *critical* graphs which are, essentially, graphs which are just in class two, but no more. Class two graphs are thin on the ground, but in general it is difficult to determine the class of a particular given graph.

Some interesting and unexpected results await the reader. For example, every planar graph with maximum valency $\rho \geqslant 8$ is of class one. (Question: is this result true with 8 replaced by 6?) Again, there are no critical graphs with 2, 4, 6, 8 or 10 vertices. Is the critical graph conjecture true, that every critical graph has an odd number of vertices?

The presentation throughout is very clear, and the number of misprints is minimal. (Unfortunately, one occurs in the statement of the four colour theorem on page 17.) Fascinating as the theory is, though, one gets the impression of a subject in its infancy, with the reader exploring the lower foothills while the major peaks still await discovery. But in presenting such a lucid introduction to the subject and a clear description of what the major peaks may well be, the authors are to be thanked for making the information so accessible. As the authors themselves write, many of the results are difficult to locate, and some of the important papers have been available only in Russian. Exercises are also provided at the end of each chapter.

IAN ANDERSON