upper limit of a sequence $\{A_n\}$ is defined effectively as $\lim_{n\to\infty}\left(\sup_{m\geqq n} A_m\right)$, but in fact the set

$$\mathscr{A}_p = \{x \mid \text{there exists } n \text{ such that } p \leqq n \in P \text{ and } x = A_n\}$$

is introduced.

Chapter 6, on definition by induction, will appeal to those who feel uncomfortable about this method of definition, but I feel that Chapter 7, on functions of a continuous real variable, including uniform continuity and uniform convergence, could be improved by suppression of some repetitive details in its first half. Also, an interval is defined in set notation, of course, and a lemma is given to prove its endpoints unique; it seems to me that this kind of thing raises more doubts in the mind of the average student than it resolves.

This, then, is rather an unconventional book. It gives a treatment of analysis, stopping short of infinite series and differentiation, which is rigidly tied to set theory. It will appeal to some and rouse antagonism in others; that there are valuable things in Chapters 1, 2, 3 and 6, everyone will admit. The text seems to be virtually free from errors and misprints, and the layout and printing are very good. P. HEYWOOD

FREYD, PETER, *Abelian Categories. An Introduction to the Theory of Functors* (Harper and Row, 1964), xi+164 pp., $7.00.

MITCHELL, BARRY, *Theory of Categories* (Academic Press, 1965), xi+273 pp., $13.75.

These two books will make it possible for any mathematician to achieve some familiarity with the motivations and foundations of the theory of categories, a subject that has been forcing itself upon our attention increasingly in recent years.

Freyd, with the laudable aim of keeping his book short, follows what he calls a " geodesic " path towards his main theorem, that every small abelian category can be embedded as an exact full subcategory of a category of modules. This rather specialised goal does not, however, seriously distort the treatment of the theory: all the important notions are introduced and treated briefly, and the exercises (of which there are many) give a hint of alternative paths of development.

The book has certain eccentricities of style, which might irritate some readers, but it seemed to me as I read that on the whole the eccentricities contributed to the quite outstanding readability of the book—and the appendix was a rare entertainment!

Mitchell's book is vastly more comprehensive than Freyd's. Several topics, such as extensions and sheaves, are treated extensively by Mitchell and only mentioned by Freyd, and the results on global dimension in Chapter IX are not to be found at all in Freyd's book. A careful attempt (which I hope will be successful) is made in the early chapters to rationalise and standardise the terminology of the subject, and the exposition throughout is clear. A useful commentary on the text is provided by the exercises, which give motivation to the definitions and illustrations of the theorems.

Because of its more ambitious syllabus, the book is harder to read than Freyd's, and the beginner would probably find Freyd less discouraging. Mitchell's book, is, however, much the more useful as a reference, and should certainly be acquired by university and departmental libraries. J. M. HOWIE

RUTHERFORD, D. E., *Classical Mechanics* (University Mathematical Texts, Oliver & Boyd Ltd., Edinburgh, 1964), viii+206 pp., 10s. 6d.

Professor Rutherford's services to mathematics and mathematical education are universally recognised, and the appearance of the third edition of this well-known book, originally published in 1951, is a testimony to its value to successive generations of students. The new edition is substantially a reprint of the second edition with only minor additions. R. SCHLAPP