

ods for the determination of flows around profiles, flows in channels and flows with a free boundary.

Chapter IV deals with the mathematical background of transonic gas dynamics. Partial differential equations of mixed type are derived and uniqueness and existence theorems are discussed.

In Chapter V some problems in transonic flows are described. In a short appendix numerical methods are considered. Finally, an extensive bibliography of about 400 papers is included.

The proofs are omitted; however, the main ideas on how to obtain the results are in most cases indicated. Further, the author formulates various new problems which arise in the theory.

In the opinion of the reviewer, the book is a valuable survey for engineers and mathematicians.

STEFAN BERGMAN

An introduction to the theory of numbers. By Ivan Niven and Herbert S. Zuckerman. New York, John Wiley and Sons, Inc., 1960. 8+250 pp. \$6.25.

This textbook provides the senior or first year graduate student with a lucid and inviting introduction to number theory. In the first eight chapters a variety of fundamental topics are systematically expounded; the remaining three chapters contain more specialized material. The chapter headings are: 1. Divisibility; 2. Congruences; 3. Quadratic reciprocity; 4. Some functions of number theory; 5. Some Diophantine equations; 6. Farey fractions; 7. Simple continued fractions; 8. Elementary remarks on the distribution of primes; 9. Algebraic numbers; 10. The partition function; 11. Density of sequences of integers. There are many praiseworthy features in the book. The style is pleasant and perspicuous; the motivation for ideas and methods is presented with didactic skill; definitions are exact; proofs are accurately stated.

The authors have taken great pains to answer a question that frequently perplexes the beginning student. "How does one solve a problem in the theory of numbers?" To this end they have furnished extensive lists of problems. (Several of these are of recent American Mathematical Monthly vintage.) Each set is pedagogically ordered, the transition from simple numerical exercise to difficult theoretical problem being swift but not violent. The authors adhere to the doctrine of separation of text and exercises. Nowhere does the proof of a theorem depend upon the results of a problem.

The approach to number theory in this book is analytical rather than historical. Only too infrequently (in the reviewer's opinion) do

the authors allude tantalizingly to the glorious history of what is, after all, the "queen of mathematics." Nevertheless, there is much here that reveals the theory of numbers as a vital and living subject. One way in which this is accomplished is by exploiting the algebraic viewpoint. The beginner is thereby provided with a reservoir of examples to solidify his conception of abstract algebra. There are also topics for the connoisseur as well as the tyro. For example, in Chapter 5 the proof of the theorem of Legendre on the Diophantine equation $ax^2 + by^2 + cz^2 = 0$ is based upon recent work of Mordell and Skolem. Again, in the last chapter, the proof of Mann's $\alpha\beta$ Theorem is modeled after the formulation of F. J. Dyson.

It is the reviewer's belief that this elementary text, written specifically for classroom use in American universities, may very well be the best in its class.

A. L. WHITEMAN

A survey of binary systems. By R. H. Bruck. *Ergebnisse der Mathematik und ihrer Grenzgebiete*, new series, vol. 20, Berlin-Göttingen-Heidelberg, Springer, 1958. 8+185 pp. DM 36.00.

Except for the vast literature on groups, the subject of binary systems is one that has emerged into the limelight only recently. Suffering in its infancy from being perhaps too much like an appendix to group theory, this book presents irrefutable evidence that this has not been the case for some time. Group theory and also lattices are deliberately and quite appropriately excluded from the survey.

The lion's share of the literature from which this survey is drawn has been discovered during the past two decades, at the same time that related topics from the foundations of geometry, non-associative ring theory and mathematical logic have also received a lot of attention. By now the subject has quite an international following.

This book seems to be the first survey of binary systems. As such it will be invaluable to the expert who desires a quick glance at what has been done as well as an excellent guide to the beginner who seeks an introduction to the subject. We are grateful to the author for having undertaken this study, especially since the quality of the writing is indeed excellent. While virtually every significant result is discussed in the text, some topics are merely mentioned whereas others receive elaborate treatment. In view of the author's many original contributions to the literature it is not surprising that he has chosen to select topics close to home for preferential treatment. Needless to say others might have elected to redistribute the emphasis. For example a proof of Post's result on the unsolvability of the word problem for semi-