in the set is itself in the set. More generally, any element of the abelian group corresponds to a set of points with integral coordinates that are "congruent" with respect to this module. Following the method employed by Frobenius and Stickelberger in their well known paper on abelian groups, the author therefore develops their properties very largely from the corresponding properties of modules.

The problem of making a change in the "basis" of a module, i.e., a finite number of points in terms of which all the points of the module may be represented by means of integral multipliers, involves naturally the question of the equivalence of matrices of a somewhat more restricted sort than that employed in the usual algebraic theory. The proof of the existence of a "reduced" basis is omitted (rather unfortunately, it seems to the reviewer), reference being made to another text by the same author. The questions of "divisibility," "greatest common divisor," and "least common multiple" of modules and matrices are treated quite fully. The same is true of the subject of the "invariants" of matrices with integral elements, which bears rather a close analogy to the more familiar theory of elementary divisors.

Following the rather extended treatment of modules and matrices in the second chapter, the remainder of the book is devoted to abelian groups. The subsequent chapters vary considerably in interest and importance, the subject of the automorphisms of an abelian group being treated quite comprehensively, while the theory of group characters, being included in the corresponding theory for finite groups in general, seems too special to attract the reader particularly. This would have been unavoidable, however, unless the scope of the book had been considerably widened.

The book should prove valuable as a reference text on the subject of which it treats, although too specialized probably to have a very wide use. It has evidently been very carefully prepared, including as it does a complete index of definitions and a fairly comprehensive bibliography. In the text definitions are emphasized by bold-faced type and theorems are in italics. Some use of numbered formulas might have been an improvement.

H. H. MITCHELL

Höhere Mathematik. Teil I. *Differentialrechnung und Grundformeln der Integralrechnung, nebst Anwendungen.* By Rudolf Rothe. 2d edition. Leipzig, B. G. Teubner, 1927. vii+186 pp.

The first edition of this volume was reviewed in this Bulletin in vol. 31 (1925), pp. 566–67. The second edition differs from the first only in unessential details, mainly matters of rewording in a number of places. One error which crept into the first edition might well have been corrected in the second; viz., on p. 116 the author states that the equations $x-e^x\cos y=0$, $y-e^x\sin y=0$ have but one common solution. By sketching the curves it is easily evident that they have an infinity of solutions, which fact one might easily guess by considering the equivalent equation $e^z=z$ in the complex variable.

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