SHORTER NOTICES

La Réduction des Séries Alternées Divergentes et ses Applications. By J. Ser. Paris, Gauthier-Villars, 1935. 6+43 pp.

Séries Lacunaires. By S. Mandelbrojt. (Actualités Scientifiques et Industrielles, No, 305; exposés sur la théorie des fonctions publiés sous la direction de P. Montel. II.) Paris, Hermann, 1936. 40 pp.

The first pamphlet is a sequel to a previous work by the same author, entitled *Calculs Formels des Séries de Factorielles.* The discussion throughout is almost entirely of a formal nature. The first part of the book is concerned with formal transformations of series obtained by use of the notion of a reciprocal sequence. If a sequence is regarded as the set of values taken on by a function $f(x)$ for positive integral values of the variable, the reciprocal sequence will consist of the coefficients obtained when the function is developed formally in a Newton interpolation series. The second part of the work is concerned with the numerical calculation of the coefficients of a factorial series corresponding to a function whose values are known for positive integral values of the variable.

The second monograph contains a succinct account of various important results connected with Hadamard's fundamental work on the relationship between the coefficients of a power series and the singularities of the corresponding function, and Julia's important extensions of the notions inherent in Picard's theorem on the behavior of a function having an essential singularity. The author considers both power series and the more general Dirichlet series, but devotes himself primarily to the discussion of series of lacunary type. A considerable number of the theorems developed in the book are due to Professor Mandelbrojt himself.

Proofs of theorems are given only in broad outline, and are omitted entirely where the method used is not of general interest. The author stresses the close relationship between the notion of a Julia line for an integral transcendental function and a singular point for a non-integral function. In this connection he introduces a method of demonstration which may be used to obtain results concerning singular points or results concerning Julia lines.

C. N. Moore

Theorie der Gruppen von Endlicher Ordnung. By Andreas Speiser. 3d edition. Berlin, Springer, 1937. 10+262 pp.

Although the third edition of this standard text contains only eleven pages more than the second edition, there are more than eleven pages of new material, compensation having been made by setting the type more compactly. The first edition of this book was reviewed by G. A. Miller in this Bulletin, vol. 29 (1923), p. 372; the second also by G. A. Miller, vol. 34 (1928), p. 526. Mention will be made here only of the changes and additions in the third edition.

The second chapter (Normalteiler und Faktorgruppen) has been entirely rewritten and Speiser now uses the generally accepted term "Homomorph" for a many-to-one mapping of one group on another. In recognition of the recent development of structure (lattice) theory he has introduced diagrams and a theorem (theorem 25) typical of this theory.

A very welcome addition is (Theorem 61) Witt's proof of Wedderburn's theorem that every finite division algebra is commutative. As given here the proof is almost too concise and it is perhaps unfortunate that it is not mentioned that the proof depends on Theorem 62. Section 43, formerly "Automorphisms of Abelian Groups," has been enlarged to include automorphisms of p-groups by the addition of Theorem 115, the Burnside basis theorem, and Theorem 116 by P. Hall on the order of the group of automorphisms of a p-group. In Section 47 the theorem of Burnside that a Sylow subgroup which is in the center of its normalizer is a factor group is proved by constructing the homomorphism. It is proved that a group whose Sylow subgroups are cyclic must be solvable. (The earlier editions proved this merely for groups of square-free order.)

In Chapter 12 on Characters, he adds a section (§60) giving an excellent exposition of the relation of representation theory to the theory of semi-simple algebras, and another (§61) giving Weyl's representations of the symmetric group by means of the Young symmetry operators. Section 65 now gives Witt's new proof of the theorem of Frobenius that a transitive permutation group in which every element except the identity displaces n or $n-1$ letters has a normal subgroup consisting of the identity and the $n-1$ elements displacing n letters.

Chapter 16 is all new and treats the composition and invariants of the complete linear homogeneous group.

A collation with the second edition reveals the further additions and changes:

Page 12. A non-redundant statement of the group axioms.

Page 27. A discussion of generating relations for the group of inversions and translations.

Page 92. The former Figure 34 has been replaced by Figure 37, a design from the grave of Senmut in the necropolis at Thebes.

Schluss. Inclusion of references to Deuring's *Algebren* and van der Waerden's *Moderne Algebra.*

Namenverzeichnis. Inclusion of twelve new names. The reference to Faà di Bruno should read p. 230 rather than p. 239.

Sachverzeichnis. Inclusion of seven new terms, in particular "Gruppoid" and "Idempotent."

MARSHALL HALL

Differential Systems. By J. M. Thomas. (American Mathematical Society Colloquium Publications, vol. 21.) New York, American Mathematical Society, 1937. 9+119 pp.

There are two types of "differential systems," systems of (partial) differential equations and pfaffian systems. It has been known since Cauchy and Pfaff that there are many relations between solutions of the corresponding two types of equations. It is the main purpose of the present book to develop the existence of solutions for the two types of equations from a formalized algebraic approach, and to exhibit their relations from the view point of Riquier's theory of "orthonomic" systems.

After two introductory chapters, Chapter III presents the formal theory of Grassmann algebra and Chapter IV the transformation of pfaffian systems into canonical form. Chapter III is self-contained and includes an elegant theory of determinants and skew-symmetric matrices. In Chapter IV the properties of the underlying ring of differentiable functions which appear as coefficients are very general, and are formally enunciated as *differential and integral assumptions.* The main assumption is that a pfaffian system in n "marks" of rank n-1 has a differential basis, and it is implied