

Campbell-Hausdorff formula for exponentials, and an introduction to the cohomology theory of Lie algebras. Finally, the 'restricted' Lie algebras arising in the case of prime characteristic are discussed in some detail. Now follow the proofs of the existence of a faithful finite dimensional representation for every finite dimensional Lie algebra, both for characteristic zero and for prime characteristic (Chapter VI), the classification of the irreducible representations by means of Cartan's dominant integral functions and, as a by-product, independent proofs for the existence of split simple Lie algebras corresponding to every connected Dynkin diagram (Chapter VII), and Weyl's formula for the simple characters derived by means of Freudenthal's purely algebraic approach (Chapter VIII). The two final chapters are devoted to the determination of the automorphism groups of the non-exceptional split simple Lie algebras over an algebraically closed field of characteristic zero and to applications of the results: the split simple Lie algebras obtained before are now shown to be non-isomorphic, and there emerge methods to obtain classification of finite dimensional simple Lie algebras over arbitrary fields of zero characteristic. In both chapters, the possibility of extending the results to the case of prime characteristic is mentioned, but the reader is referred to the literature.

Each chapter ends with a collection of interesting examples, many of them highly non-trivial, designed to supplement the text in various ways.

The bibliography of about 150 items is meant to provide the principal references for the text and further reading on the various applications and related subjects. It is full, but is not--and is not intended to be--exhaustive.

Hanna Neumann

Elementary Differential Equations, by William Ted Martin and Eric Reissner. Second edition. Addison-Wesley, Reading, Massachusetts, 1961. xiii + 331 pages. \$6.75.

The first edition of this book was published in 1956 and reviewed by J. Korevaar in the *American Mathematical Monthly*, Vol. 65, No. 6, June-July 1958, pp. 457-9. The second edition contains many new exercises but is not essentially different from the first. Consequently, the cited review is equally pertinent to the second edition, and this review will be brief.

The book is designed as a text for an introductory course and deserves to be recommended for this purpose. The introductory chapter on the nature and origin of differential equations contains

attractive material which the student may not appreciate until he has developed some skill in solving equations. As the authors suggest, some of this material may be inserted at convenient points throughout the text.

The treatment of power series solutions is exceptionally good. The student is first introduced to this topic in connection with first order linear equations. From this, he progresses gradually to series solutions of non-linear first order equations, second order equations, and  $n$ th order equations. The distinction between solutions at ordinary points and at regular singular points is clearly drawn. Many examples are used to clarify the discussion.

Systems of first order equations are treated without the use of matrix notation. This reviewer, in common with the earlier one, regards this as unfortunate. A similar comment applies to the failure to exploit the operator  $D$  in the solution of linear equations with constant coefficients.

The chapter on approximate solutions of differential equations leads up to a proof of Picard's existence and uniqueness theorem. There is a short chapter on finite difference equations.

The last chapter is devoted to partial differential equations which can be solved by finding solutions for corresponding ordinary equations. This reviewer, unlike the previous one, approves of this chapter.

Randal H. Cole, University of Western Ontario

Les transformations intégrales a plusieurs variables et leurs applications, H. Delavault. (Mémorial des sciences mathématiques, fascicule CXLVIII.) Gauthier Villars, Paris, 1961. 94 pages.

A number of books have been written on individual integral transformations in several variables. Here the salient facts on such transformations in general, and various particular transformations are collected. The purpose of the authoress in doing so is best expressed in her own words, "Un cours en Sorbonne du Professeur H. Villat nous montre tout l'intérêt qu'il y a à considérer les développements en série de fonctions propres, associées aux équations différentielles du deuxième ordre, sous l'aspect de transformations intégrales finies. . . C'est ce changement de point de vue qui justifie l'étude que nous allons faire."

The book comprises eight chapters, and three appendices, the first chapter being devoted to integral transformations in general.