A Short Course in Differential Equations and *Elementary Differential Equations*. Both by E. D. Rainville. Macmillan, New York, 1958. x+259 pp. $4.50 and xii+449 pp. $5.50.

The first of these two books was designed for a semester course in ordinary differential equations. Its seventeen chapters cover the usual topics exceptionally well with an adequate number of exercises—approximately 1250. The author's aim in trying to exhibit both the techniques for obtaining solutions and the basic ideas and theory behind these techniques is fully realized.

The first seventeen chapters of the second book are identical to the above; nine additional chapters are included in order to make this text suitable for a two-semester course in differential equations. Of special note are the chapters on the Power Series Method and Solutions Near Regular Singular Points. Chapters on Equations of Hypergeometric Type—covering a short introduction to the gamma and factorial functions, the hypergeometric and confluent hypergeometric equations, Bessel's equations, and the polynomials of Legendre, Hermite, and Laguerre—and Orthogonal Sets contain material not included in the first edition. The text concludes with sections on Partial Differential Equations, Fourier Series, and Boundary Value Problems.

Both texts contain excellent treatments of the material considered, especially from the point of view of the student. Explanations are clear and examples are helpful. The difference of only one dollar in price between these two books leaves no doubt in the mind of the reviewer that the Elementary Differential Equations book is preferable under any circumstances.

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Modern Mathematical Methods and Models, Volume 1. Multicomponent Methods. By the Dartmouth College Writing Group. Photolithoprinted, 1958. iii+327 pp. (Any interested person may get a free copy by writing to Professor H. M. Gehman, Mathematical Association of America, University of Buffalo, Buffalo 14, N. Y.)

"This is the first of two volumes of experimental-text materials written by the Dartmouth College Writing Group for the Committee on the Undergraduate Program (CUP) of the Mathematical Association of America. These two volumes form the basis of a CUP course for sophomores specially interested in the biological and social sciences. Volume 1 covers the first semester of this course."

Volume 1 consists of four units of approximately equal length. The first unit, on matrix and vector algebras, develops the necessary algebraic language and tools for both volumes. Topics discussed include systems of linear equations and inequalities, inverse and characteristic values of a matrix, and linear and affine transformations.

Unit two is on calculus and finite differences. Extensive use is made in this unit of *A Handbook for Calculus, Difference and Differential Equations* by E. J. Cogan and R. Z. Norman (New York, 1958). Various types of differential and difference equations are solved using the *Handbook*.

The third unit is on multivariable functions, with emphasis on linear and quadratic functions. Topics discussed include linear and quadratic approximations of functions, canonical quadratic forms, and convex sets and functions.

The final unit is on optimization problems. After a discussion of the usual extrema problems of the calculus, extrema problems of a function subject to constraint equations and inequalities are presented. This leads naturally into linear programming, the final topic of this volume.

This book is written in a pleasingly informal way, with many interesting examples from economics, biology, *etc.*, throughout. It is the opinion of the reviewer that the authors have succeeded admirably in performing their assigned task.

RICHARD JOHNSON
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Introduction to The Theory of Determinants and Matrices. By Edward Tankard Browne. The University of North Carolina Press, Chapel Hill, 1958. 270 pp. $7.50.

The style of this book is that of formally stated theorem followed by proof. The approach is that of the explicit writing out of the components of matrices, and numerical illustrations are frequent. Among the attractive features of the book are the clear exposition (with some exceptions as in the treatment of determinants), the extensive lists of problems and the generally clear printing and organization of material. Many teachers will welcome the quite explicit treatment (illustrated by worked numerical examples) of lambda matrices, elementary divisors and related topics. Some items in the book will be novel and of especial interest for numerical computations with matrices. Thus the signature of a quadratic form is used (p. 136) to determine the number of distinct pairs of conjugate roots of a polynomial and this is applied in the problems with good effect to the study of the cubic and quartic cases.

Although vector spaces are defined (p. 51), there is very little use of the concept and a matrix is rarely regarded as an operator on a space. The concept of dual space appears not to be used at all. For a course serving as a foundation for further study of algebra, this point of view makes the book unsatisfactory despite its positive virtues for the explicit numerical treatment of matrix problems. In a few places the basic concept is not brought out clearly. For example, the Kronecker reduction of a quadratic form is proved with some care, yet the basic idea that the process consists essentially in completing the square is not emphasized.

The material covered includes that common to most current books on matrix algebra and also considers the equivalence of pairs of bilinear forms. The last