WEIL, ANDRÉ, *Introduction à l'étude des Variétés Kählériennes*, Actualités scientifiques et industrielles 1267, Publications de l'Institut de Mathématique de l'Université de Nancago VI (Hermann, Paris), 175 pp., 2000 francs.

This is a useful presentation of the calculus of differential forms and their classification on a Kähler manifold on the basis of the theory for a general differentiable manifold as given in de Rham's book in the same series. The relation between divisors and forms of special type is given and there is a detailed application to the theory of theta functions and abelian varieties. There is no account of the applications to general algebraic varieties. D. J. SIMMS

KOPAL, Z., *Numerical Analysis* (Chapman & Hall, London, 1955), 570 pp., 63s.

This otherwise useful work is unfortunately marred by the author's style and mode of presentation, so that it is rather difficult to read. This difficulty is increased by the use of the now obsolescent astronomical notation of Δ with roman superscripts to denote all differences, central, forward or backward. Although therefore the book gives a good survey of certain branches of numerical analysis, including much that is not readily available elsewhere, it cannot be recommended to a beginner. Those with some experience in the field, however, will find it an interesting, stimulating and informative work.

After an introductory chapter mainly of a conversational nature, the subject is introduced by polynomial interpolation. Principally this covers Lagrangian and Finite Difference methods ; formulæ being proved by the assumption of a polynomial expansion. The method of " throw-back " is dealt with in fair detail, but it is erroneously stated that the usual throw-back coefficients cannot be used with the Everett formula.

Differentiation of the formula for interpolation enables the standard numerical differentiation formula to be established, and one is pleased to see a discussion of the optimum interval of tabulation if derivatives are required. An application of numerical differentiation is to curve fitting, but there is no discussion of the " noise " problem.

The solution of ordinary differential equations is introduced by the solution of $y' = f(x)$ and $y'' = f(x)$ using difference formulæ with central and backward differences. The methods are extended first to the equations $y' = f(x, y)$ and $y'' = f(x, y)$, including also the use of Hermite formulæ, and then to general types of equations. A Taylor Series expansion, Picard's successive approximations, and an assumed power series expansion are used to start a solution, but the general method of solution in series due to Frobenius seems rather out of place here. The chapter concludes with descriptions of recurrence formulæ methods (including a discussion of the errors) and Runga-Kutta methods.

An extensive treatment of boundary value problems follows, first by the use of linear algebra methods. As the solution of matrix problems has been relegated to an appendix, this section necessarily treats the problems in an individual manner. There is, for example, no mention that the methods used are equivalent to those for determining the latent roots of a matrix. Other approaches to the problem, namely by the methods of variation, iteration and collation are then described.

The section on quadrature includes an exhaustive treatment of the Gaussian approach using various weight-functions. Subsequently the Newton-Cotes formulæ and the various rules are discussed and there is some treatment of formulæ for the integration of special functions as for example $\int f(x) \sin mx dx$.

A last chapter is devoted to the solution of integral and integro-differential equations principally by the same methods as for boundary value problems viz. :

linear algebra, iteration, and collation. This is admitted to be limited treatment in a relatively new field. However, there is a considerable amount of the theory on integral equations in this chapter including the derivation of integral equations, which again seems out of place in a book on numerical analysis, especially as the advantage or otherwise of obtaining integral equations is not discussed.

Of the five appendices, two contain tabular material, namely Lagrangian coefficients for numerical differentiation, and abscissæ and weights for Gaussian and other quadratic formulæ. The other three are devoted to Tchebysheff interpolation, operator methods, and algebraic equations, the first being by far the most important.

D. C. GILLES

CULBERTSON, J. T., *Mathematics and Logic for Digital Devices* (D. van Nostrand Co., Ltd., London, 1958), 217 pp., 36s.

The main criterion of this book is that one is unsure to whom it is directed. The publishers and author describe it in terms of " a study of the special kind of mathematical reasoning essential to the use of computers ". Taking these words at their face value, they express a statement which, to the reviewer, is decidedly fallacious. The field covered by this book is not essential to *users* of computers ; it may, however, be of interest to those engaged in the design and construction of computers and the related biological field.

The book gives in fact an elementary account of certain branches of mathematics, namely permutations and combinations, probability, traditional logic, and Boolean algebra, together with two chapters on topics applicable to computers, number systems and switching circuits. This is preceded by an introductory chapter giving a résumé of ideas that are considered known—notably the definition and examples of algorithms, and an explanation of the notation for finite sums and products—and introducing the conception of a " neuron ".

The mathematical topics are treated with a slight bias towards computers ; for example, the chapter on probability includes a discussion of nerve nets composed of neurons. On the whole, however, the material can be found in any textbook within the field, and the treatment is in no cases more than elementary—witness the inclusion of a chapter on permutations and combinations.

Of the other chapters, that on numerical systems considers numbers of any radix. Arithmetical operations with such numbers are explained, and nerve nets for certain operations (including addition and subtraction) of binary numbers are included. These nets always consider parallel operation with consequently greater complexity in structure, but this is not mentioned.

The chapter on switching circuits is concerned mainly with the representation of circuits by Boolean algebra. The use of this method in the simplification of circuits is discussed, and the construction of some circuits satisfying given closure conditions described.

On the whole little is covered by this work that is not available elsewhere. Its one advantage seems to be that an account of certain fields of mathematics relevant to the design of computers occurs within one book.

D. C. GILLES

ROY, S. N., *Some Aspects of Multivariate Analysis* (John Wiley & Sons), 214 pp., £3, 4s.

In contrast to Professor T. W. Anderson's recent book on multivariate analysis, this book by Professor Roy is not a textbook of standard multivariate theory. It is concerned with certain fairly recent developments in this field, due mainly to the author. These developments spring from the notion of simultaneous