

The final chapter, on algebraic independence of transcendental numbers, contains an exposition of Siegel's method, by means of which it can be shown, under suitable circumstances, that algebraically independent solutions of a system of linear differential equations have algebraically independent values for algebraic argument. The general framework of the method is set out very clearly, and applications are made to (a) Lindemann's theorem, that if $\alpha_1, \dots, \alpha_n$ are algebraic numbers, linearly independent over the rationals, then $e^{\alpha_1}, \dots, e^{\alpha_n}$ are algebraically independent over the rationals; and (b) Siegel's theorem, that if $x_0 \neq 0$ is algebraic, the values $J_0(x_0)$ and $J'_0(x_0)$ of the Bessel function are algebraically independent over the rationals.

The book ends with an interesting list of open problems which the author considers both important and attainable.

W. J. LEVEQUE

Applied analysis. By Cornelius Lanczos. Englewood Cliffs, Prentice Hall, 1956. 20+539 pp. \$9.00.

This is a systematic development of some of the ideas of Professor Lanczos in the field of applied analysis, rather than another textbook. Instead of the adjective "applied," the author suggests that "parexic"¹ would be more appropriate. Parexic analysis lies between classical analysis and numerical analysis: it is roughly the theory of approximation by finite (or truncated infinite) algorithms. There is, therefore, some overlap with what is being called elsewhere "constructive theory of functions." However, this book is a very personal one, and has been influenced by the varied experiences of the author: in regular academic work, in government service, in industry, and now at the Dublin Institute for Advanced Study.

This is not a book for beginners: however an advanced class of mathematically inclined engineers (or physicists) or numerically inclined mathematicians would be rewarded by working through it critically. The various topics covered: algebraic equations, matrices and eigenvalue problems, large scale linear systems, harmonic analysis, data analysis, quadrature and power expansions, are all illustrated by numerical examples worked out in detail. There is a useful collection of tables, in particular a table of Laguerre polynomials, to facilitate the study of electrical networks by means of Laplace transforms.

Practicing numerical analysts will be glad to have available up-to-

¹ The word is derived from the Greek para, almost, ek, out of.

date accounts of the various techniques they associate with the author such as: Chebyshev approximation, the τ -method, minimized-iteration and spectroscopic eigenvalue analysis. They will find many uses of these methods not only in their day-to-day problems, but also in their research activities.

JOHN TODD

Die Berechnung der Klassenzahl Abelscher Körper über quadratischen Zahlkörpern. By Curt Meyer. Berlin, Akademie-Verlag, 1957. 9+132 pp. DM 29.

The class number formula for an abelian extension of the rational field, originally given by Dirichlet and Kummer for a quadratic or cyclotomic field respectively, is certainly one of the most beautiful results in classical number theory. In the present book, the author studies the problem of establishing a similar formula for the class number of a finite algebraic number field K which is contained in an abelian extension of a quadratic field F . When K itself is an abelian extension of F , certain results in this direction have been already obtained by Dedekind, Fueter and Hecke. But the author gives here a complete and systematic solution of the problem including all these previous results.

With the introduction explaining the historical background of the problem, the book is divided into three parts with the following titles: I. Algebraic, arithmetic and analytic foundations, II. Kronecker's "Grenzformeln" for the L -functions of the ring- and Strahl-classes in quadratic fields, and their application on the summation of L -series, III. Class number formulae. Of these, the most essential one is the second part which occupies about two thirds of the whole book. Here the author carefully carries out the summation of L -series with classical technique, considering several cases separately according as F is real or imaginary and, also, according to the nature of the conductor of the character in the given L -series. The actual computation is not very simple, but it is neatly given in every detail.

Though the book deals exclusively with a rather special topic, the final result, namely, the class number formula for K , seems to have wide implications in algebraic number theory, suggesting many important problems in the field. In case F is imaginary, the class number of K is expressed in terms of certain singular values of the functions which are familiar in the theory of elliptic modular functions, and this naturally suggests that there exists a deep relation between the class number formula and the theory of complex multiplication which is yet unknown to us. On the other hand, if F is real, the class