

Lehrbuch der Algebra. Volume 3: *Algebraische Zahlen*. By R. Fricke. Braunschweig, F. Vieweg und Sohn, 1928. vii+506 pp.

Each year there appears in Germany a new book on algebraic numbers. This fact reflects the central position of that subject in current research, as well as the richness of its material from which the various authors have made different selections.

This book devotes 189 pages to the general theory of algebraic numbers, 103 pages to cyclotomic fields (determined by a root of unity), quadratic fields and applications to forms $ax^2+bx+cy^2$, and finally 211 pages to class invariants and class equations. The final topics relate to the complex multiplication of elliptic functions, with emphasis on the arithmetical and algebraic aspects, a subject first fully clarified by R. Fueter in his work in two volumes (Teubner, 1924, 1927). The pioneer book was Weber's *Elliptische Functionen und Algebraische Zahlen* of 1891, which was later counted as volume 3 of his *Algebra*. This explains the phrase on the title page of Fricke's book, "verfasst mit Benutzung von H. Weber's gleichnamigen Buche." While this was partially true of the first two volumes, it hardly applies to this third volume.

This text gives a readable introduction to the modern theory of algebraic numbers apart from the analytic theory of the distribution of primes and prime ideals. It makes use of O. Ore's recent simpler methods and extensions. In the final part of the book, Fricke was in his own speciality, the theory of elliptic modular functions.

The three volumes together make a worthy successor to Weber's *Algebra*, which is now out of print.

L. E. DICKSON

Repertorium der höheren Mathematik. By E. Pascal. Second edition, completely remodeled, of the German translation, edited by E. Salkowski and H. E. Timerding. Volume I (*Analysis*), part 3. Leipzig-Berlin, Teubner, 1929. Pp. xii+1025-1598.

This is the final part of the *Analysis* volume of the second edition of the *Repertorium*; the first part appeared in 1910 and the second in 1927. It contains the following chapters: 20, modern theory of real functions, by E. Kamke; 21, modern developments in the theory of ordinary differential equations, by G. Hoheisel; 22, the theory of boundary problems in partial differential equations, by W. Sternberg; 23, finite differences, by A. Walther; 24, the theory of integral equations and functions of infinitely many variables, and their application to boundary problems in ordinary and partial differential equations, by H. Hahn, L. Lichtenstein and J. Lense; 25, trigonometric series, by A. Plessner; 26, spherical harmonics, Bessel and similar functions, by E. Hilb; 27, theory of numbers, by E. Bessel-Hagen. All of the authors have very successfully achieved their purpose of presenting concisely the main results of their subjects together with references to the more important literary sources, and the book will undoubtedly prove indispensable to the workers in any of the fields treated.

T. H. GRONWALL