Bericht über neuere Untersuchungen und Probleme aus der Theorie der algebraischen Zahlkörper. By H. Hasse. Teil I. Klassenkörper. Teil I[a]. Beweise zu Teil I. Teil II. Reziprozitätsgesetze. Leipzig, Teubner, 1930. 134+4+204 pp.

In a series of articles in the Jahresbericht der Deutschen Mathematiker-Vereinigung, Hasse has given a general report on the recent development of the theory of class-fields and the laws of reciprocity. These articles have now appeared in a separate edition and form a valuable addition to Hilbert's report on the theory of algebraic numbers. It would be highly desirable to have similar modernizations of other parts of Hilbert's report.

The first part contains mainly a simplified representation due to Hasse of Takagi's and Furtwängler's principal results, proving the existence of class-fields corresponding to any class division of the ideals in an algebraic field, and the completion theorem, that every relative abelian field can be considered as a class-field for some class-division in the fundamental field. There are also applications of the general theory to the theorem of Kronecker-Weber, that every absolute abelian field is a subfield of a cyclotomic field, and also to the "Jugendtraum" of Kronecker, that is, the representation of all abelian fields relative to a quadratic imaginary field by means of singular moduli.

In Part 2, Hasse proves the general law of reciprocity of Artin and applies it to prove the various special laws of reciprocity. One also finds various applications to ordinary theory of numbers, particularly to Fermat's theorem.

It is impossible to give a detailed discussion of the report, without using a great number of technicalities. It may suffice to say that it is a remarkable piece of work and that it will be a sourcebook for the future work in this field.

OYSTEIN ORE

Einführung in die Theorie der Wellengleichung. By Harry Schmidt. Leipzig, J. A. Barth, 1931. vi+146 pp.

This book gives in a short compass and in painstaking manner an account of those topics in differential equation theory which are now commonly regarded as essential for graduate students of theoretical physics. The book is a useful introduction to the more ample, world-renowned books by Courant-Hilbert and Frank-von Mises. In ordinary differential equation theory a short and good account of Fourier series and Fourier integrals is given and a few pages are given to the Sturm-Liouville boundary-value problem. For two-dimensional problems the usual method of reduction to one dimension by separation of the variables is followed and the gamma function and Bessel functions are discussed (in addition to Fourier series in two independent variables). The Fuchs theory of singular points of ordinary linear differential equations is treated and Legendre polynomials are discussed as illustrating this theory. A final chapter contains a discussion of the Schrödinger wave equation.

The book will evidently be very useful. One could criticise it as too pedantic and object to the heavy pages of formulas. The systematic avoidance of vector analysis and of geometric references helps to produce this impression. No reference is made to Riemann's method of integration for hyperbolic equations. The printing maintains the high standard set by the publisher.

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