Leçons Élémentaires sur le Calcul Numérique. By E. Cahen and C. Michel. Paris, Gauthier-Villars, 1931. 111 pp.

In this book the authors emphasize the laborious feature of mathematics which is almost always avoided by students and teachers in American colleges. For the most part, the problems treated are those which arise in a first course in the calculus and the purpose is to obtain numerical results to a rather high degree of accuracy. Numerical equations, both algebraic and transcendental, are solved by Newton's method and by the method of successive approximations. Some of the problems demand results to 12 decimal places. Polynomials are evaluated by synthetic division and by interpolation and extrapolation, using all of the successive differences. Considerable attention is given to the sum of a series, when the degree of accuracy is prescribed in advance. The last chapter is devoted to the evaluation of definite integrals by means of series, the trapezoidal rule, and Simpson's rule.

W. R. LONGLEY

Die Pseudosphäre und die Nichteuklidische Geometrie. By F. Schilling. Leipzig, Teubner, 1931. v+70 pp.

In the second volume of his *Projektive und Nichteuklidische Geometrie*, which I reviewed in this Bulletin a short time ago, Professor Schilling gives a comprehensive treatment of non-euclidean geometry from the projective standpoint. The present monograph aims at a more popular presentation of hyperbolic geometry by models of the pseudosphere and its map on the upper half of a complex plane, or Cartesian plane in which the lines are represented by semicircles cutting the real x-axis orthogonally. The analytic geometry and trigonometry of hyperbolic geometry are worked out on this basis. This method affords undoubtedly the shortest and most effective approach to the subject, and Schilling is thus very successful in presenting and elucidating a very interesting geometric field to persons with only elementary mathematical training.

ARNOLD EMCH

Caratteristiche dei Sistemi Differenziali e Propagazione Ondosa. By Tullio Levi-Civita. Lezioni raccolte dal Dott. G. Lampariello. Bologna, Nicola Zanichelli, 1931. vii+108 pp.

These lectures give a clear account of that branch of partial differential equations in which attention is focused on the problem of Cauchy and its exceptional cases. This problem leads naturally to the idea of characteristics and the relation of these to waves of discontinuity is elucidated by the formulation of kinematical and dynamical conditions of compatibility at the wave-front.

When the partial differential equation of the characteristics is of the first order and is expressed in a normal form by solving for the partial derivative with respect to the time, a theory of rays may be based on an associated set of differential equations of the Hamiltonian form which the authors call the bicharacteristics, thus adopting the terminology of Hadamard instead of that of Cauchy. The theory is well illustrated by examples from hydrodynamics, optics, and the recent theory of de Broglie waves.

H. BATEMAN