this more detailed account, the spherical-elliptical geometry is disposed of in one short chapter. The last chapter is on non-euclidean mechanics; and the book is concluded by a few pages in which attention is directed to some of the discussions about the nature of actual space.

E. B. COWLEY.

A Brief Introduction to the Infinitesimal Calculus. Designed especially to aid in reading mathematical economics and statistics. By IRVING FISHER, Ph.D., Professor of political economy in Yale University. Second edition. New York and London, The Macmillan Company, 1906. 12mo. xiii + 84 pp. Price, 75 cents.

THIS book gives an excellent bird's-eye view of the differential calculus, and indeed of the integral calculus. It is written with remarkable clearness, the illustrations from geometry, physics and economics being well chosen and well placed. In this, the second edition, the notion of the "little zero" is not used. Its use in the first edition was criticized by Professor Fiske in his review of the book in the BULLETIN, February, 1898, page 238.

Though small, the book is very comprehensive. If it were to be enlarged, the first addition would perhaps be an article on the mean value theorem, of which article 69 is suggestive, and a page or two on integration as summation, in place of the two short articles 76, 87. Some footnotes, such as the one inserted in the German edition (Teubner, 1904) for article 35, would add to the logical completeness of the proofs, and a few slight changes might be made in the introductory chapter.

The book contains about 200 well selected problems, and is an admirable text-book. It supplies the need, felt by some, of a text-book for those who wish to become familiar, in a short time, with the fundamental conceptions of the calculus.

EDWARD L. DODD.

Leçons sur les Fonctions Discontinues. Par RENÉ BAIRE. Rédigées par A. DENJOY. Paris, Gauthier-Villars, 1905. 8vo. viii + 127 pp.

IN these Leçons the Borel series of monographs has given us a work of fundamental importance in a too long neglected field. The interest in discontinuous functions is happily increasing, and finds in this little book a basis for attack and for classification, so essential if we are not to grope blindly. The following theorem gives the main results: *

A necessary and sufficient condition that a function be the limit of continuous functions is that it be pointwise discontinuous on every perfect assemblage.

Attention should also be called to the concept of semi-continuity, introduced in the proof of this theorem. The limit of the maximum values taken on by a limited function f in intervals (C, D) containing the point A, as (C, D) approaches zero, is called the *maximum* of f at A. If this equals the functional value at the point A, f is said to possess *upper semi-continuity* at A.

The book closes with a general classification of functions. Continuous functions constitute class 0; limits of continuous functions, not themselves continuous, form class 1; in general, limits of functions of class n, not belonging to class n, form class $n + 1$. No attempt is made to show that there exist functions in each class.†

In accordance with the general plan of the series, no advanced mathematical knowledge on the part of the reader is presupposed; this has fortunately compelled the author to give us a very clear and elegant treatment of certain portions of the theories of assemblages and transfinite numbers.

W. D. A. WESTFALL.

Differential Equations. By D. F. CAMPBELL, Armour Institute of Technology. New York, The Macmillan Company, 1906. 96 pp.

THIS is a text-book intended to give a student of engineering a short, practical course in solving differential equations. The author gives only the most common, straightforward methods and omits integrating factors, singular solutions, geometric interpretations, etc.

The first chapter recalls some theorems of algebra and calculus and gives the derivation of a differential equation from its primitive. The use of j instead of i to represent $\sqrt{-1}$ can hardly be considered an improvement. The second chapter deals with changes of the variable (which are practically never used in the rest of the book). It might well have given

* The proof has been simplified by H. Lebesgue, Leçons sur les fonctions de variables réelles par É. Borel, note 2.

† Lebesgue has proved that functions exist in each class, *Journal de Mathématiques*, 1905.