sufficient; but there is an equation of this form, occurring frequently in astronomy, in which the coefficients lie between certain limits. An extra table, occupying half a page, is, therefore, included, giving the results to seven places of decimals. Explanations and examples are added. It will be noted that a slight variation from Gauss is made in the form given to the equation.

<div align="right">ERNEST W. BROWN.</div>

RECENT TEXT-BOOKS OF THE CALCULUS.

Easy Lessons in the Differential Calculus. Indicating from the outset the utility of the processes called differentiation and integration. Fifth edition. By RICHARD A. PROCTOR. London and New York, Longmans, Green, and Co., 1894. Small 8vo, vii + 114 pp. Price, 90 cents.

A Primer of the Calculus. By E. SHERMAN GOULD. New York, D. Van Nostrand Company, 1896. 12mo, 91 pp. 17 folding plates. Price, 50 cents.

A Brief Introduction to the Infinitesimal Calculus. Designed especially to aid in reading mathematical economics and statistics. By IRVING FISHER, PH.D., Assistant Professor of Political Science in Yale University. New York and London, The Macmillan Company, 1897. Small 8vo, vii + 84 pp. Price, 75 cents.

These three little books can together be easily slipped into a coat pocket of ordinary size. The first is written in the least technical language. It is devoted chiefly to problems in maxima and minima and areas, but it touches upon a number of other applications. The subject is developed by means of concrete examples, the problem of a falling body being used in the two introductory chapters to explain both differentiation and integration. Differentials are described as *infinitely minute* quantities, but the reader is warned against regarding dy/dx as the ratio of two *separable* quantities. The explanations are almost everywhere remarkably full and clear. That showing the distinction between dy/dx and dx/dy, however, is very unsatisfactory. The book contains many examples fully worked out, but there are no unworked ones and the reader is, therefore, unable to test his understanding or proficiency.

The second work gives rules without pretence of demonstration and almost without explanation. It consists chiefly of worked out examples covering about the same ground as the preceding work. We are told that "dx is purely imaginary and has no numerical value," and again that "the differential dx of a straight line represents its in-

divisible atom." The author then proceeds without more
ado to expand $(x + dx)^2$ by the ordinary rules of algebra.
He rejects dx^2 because the existence of a quantity still
smaller than dx is inconsistent with his fundamental
hypothesis.

Professor Fisher's book, which is more ambitious than
either of the preceding works, includes, among other sub-
jects, Taylor's theorem, multiple integration and functions
of more than one variable. It contains many unworked
examples. In Article 5 we read : " The zeros ds, dt and
others obtained by the vanishing of finite quantities are
called *infinitesimals* or *differentials*. They are, however, true
zeros and not simply very small quantities." In Article
20 the equation $dy = 2dx$ occurs. The author says:
" Now the student will object at once that, since dy and dx
are zero, the last equation, though true, is no truer than
$dy = 3dx$. This is correct enough and yet we cannot em-
ploy the latter equation to show the rate at which y in-
creases compared with x when y and x are connected by the
relation $y = 2x$." In the space given to explaining away
the difficulties which arise from his definitions the author
certainly could have given and explained the more conve-
nient definition that dy is the *principal part* of the increment
of y when an increment is added to x. We learn from the
preface that the book was prepared with a view to enabling
persons without special mathematical training or aptitude to
understand the work of the economists Jevons, Walras,
Marshall, and Pareto, and the mathematical articles con-
stantly appearing in the *Economic Journal*, the *Journal of the
Royal Statistical Society*, the *Giornale degli Economisti* and else-
where.* The student who masters the book will be able to
do this in a measure, but it seems plain that a person who
has read only the mathematics which he wishes to use, will
not have acquired sufficient facility to proceed without
constant stumbling.

Of the three books Proctor's is the best one to impart to
the general reader an idea of the subject matter of the
calculus.

<div align="right">THOMAS S. FISKE.</div>

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* For some account of the application of mathematics to the theory of
economics, see the review of Professor Fisher's " Mathematical investiga-
tions in the theory of values and prices," *Bulletin of the New York Mathe-
matical Society*, vol. 2, pp, 204–211 (June, 1893.).