The book as a whole is carefully planned and well written; it broadens the student's point of view, stimulates his interest in the subject, and gives him no false notions which he will have to unlearn later. In the opinion of the reviewer it will prove itself very helpful, not only to the class of students for whom it was especially prepared, but also to teachers who are engaged in this field of work; it is especially to be commended to the attention of mathematics teachers in our own secondary schools.

Besides a few obvious misprints which have been detected in reading the book (on pages 92, 116, 120, 124, 126, 149, 152, 181, 189 and 194), the following minor criticisms may be mentioned: (1) The mechanical make-up of the book would be greatly improved by emphasizing the sectional divisions. This could be done by appropriate headings, in heavy-faced type perhaps, or by merely spacing between consecutive sections. As it now stands it requires a real effort to find the beginning of a section to which subsequent reference may have been made. (2) Of all the topics that such a book as this should contain, from the point of view of either of the two classes of students for whom it was written, it would seem that one of the most appropriate would be a detailed presentation of mathematical induction; yet although this method of proof is employed in the book, its essential character as a distinct type of mathematical reasoning is not brought out. Neither is the theorem of undetermined coefficients proved, though it also is freely used. (3) In connection with Cardan's solution of the cubic equation it is carefully pointed out that although the expressions for the roots involve imaginary elements, when all the roots are real and unequal, yet these imaginary parts cancel each other. It is a pity that the author did not go a step farther right here and show that the actual calculation of the α or β which is involved in these roots would itself require the solution of a cubic equation all of whose roots are real and unequal, and so explain why this is usually called the "irreducible case."

J. H. Tanner.

A First Course in Infinitesimal Analysis. By Daniel A. Murray. Longmans, Green & Co., New York, London and Bombay, 1903. xvii + 439 pp.

In common with Professor Murray's other books, this one contains numerous historical notes and references for collateral reading. These add much to the value of the book. But in looking over the references the reviewer has been struck by what seems to him a notable lack — a lack however that is shared by practically all our elementary text-books. These references are for the most part to works in English, and not many of them can be called classical treatises. Now, unquestionably, a great majority of the students who use this book will pay but little attention to any of these references. A few of the brighter and more ambitious ones will follow them up and will find them well suited to their needs. But the young man who has in him the making of a fruitful mathematician needs the inspiration and guidance of the masters, and his elementary text-books should show him where these needs can be satisfied. In this country, at least, such a student is in great danger of being distracted by too many intermediaries. The precious years of youth, which is the creative period, should be used to the utmost advantage. Professor Murray, in making his references, does not seem to have had in mind this smallest, but by no means least important, class of students.

In reading Chapter X one cannot help feeling that the author would have succeeded better in his effort to connect the two ways of looking at integration if he had shown that the definite integral, considered as function of its upper limit, is the anti-differential of the integrand, instead of merely showing, as he does, that the definite integral, considered as the limit of a sum, can be obtained through the mediation of the anti-differential. An unfortunate statement is made in Article 126 in discussing integration of series. The fact that the limits of integration must, in general, be contained *within* the interval of convergence of the integrand (expressed as a power series) seems to have been overlooked, although a direct reference is made to Article 172, where there is a correct statement of the case.

The discussion of the integration of irrational expressions does not seem to be in keeping with the general spirit of the book. The rationale of the processes is not discussed. The student is merely told that certain substitutions will lead to the desired result. To be sure, many of these substitutions must, at best, be arbitrary. But the number of these should be reduced to a minimum.

We have been dwelling on those points wherein it seems to us the book might be improved. Happily there are very few of these. The book is an unusually good one. Throughout there are excellent figures to illustrate points in the text. The figure exhibiting the reason for the ambiguity in sign of the derivative of $\sin^{-1}x$ is one that will be found especially helpful to the student. Indeterminate forms are assigned to a note at the end of the book. This seems to be far more in keeping with the relative importance of the subject than the treatment usually given in American text-books.

The chapter on infinite series is certainly an excellent one. It is more extensive than the corresponding one in many elementary books. The discussion of term-by-term differentiation and integration of infinite series is especially to be praised. The chapter on Taylor's theorem maintains the same standard. This chapter is put much later than usual.

There is a short chapter on differential equations, and an appendix in which hyperbolic functions, intrinsic equations, indeterminate forms, and applications to mechanics are discussed. After a set of questions and exercises and a table of integrals, some of the more common curves with their equations are given.

This latest and most extensive of Professor Murray's books is at the same time much the best one.

WILLIAM BENJAMIN FITE.

Elementary Algebra. By J. H. TANNER. New York, American Book Company. x + 364 pp.

THE present work is an attempt to solve a problem whose difficulties only those have realized who have seriously and conscientiously attempted to outline a course of instruction in elementary algebra which shall be teachable in the first place, but which on the other hand shall not constantly offend one's sense of rigor. There is a middle course here between Scylla and Charybdis; between the rigor of a work like Stolz and Gmeiner's Theoretische Arithmetik and the conventional algebras, whose authors draw their ideas from an age mathematically as remote as the age of stone and bronze.

Where does the best course lie between these grave perils? We do not know. *À priori* reasoning is of little avail here; it is a question which must be worked out by actual experience.

The present volume is a noteworthy and precious contribution in this direction. With ample knowledge of the founda-