

With these meticulous criticisms we may join a third. On page 67 we read: "Zwei Kurven derselben Klasse sind aber nicht immer ineinander projizierbar (vgl. z. B. die Dreiecks- und Viereckskurve dritter Ordnung S. 70). Die Einteilung nach der Klasse ist also keine projektive." A non sequitur is an agreeable rarity, and this has evidently, from the context, slipped in through some oversight.

In laying down this multum in parvo, we must commend the sections on quadratic transformation and the cuts exhibiting conics and their various related rational quartics.

H. S. WHITE.

*Lehrbuch der Mathematik für Studierende der Naturwissenschaften und der Technik. Einführung in die Differential- und Integralrechnung und in die analytische Geometrie.* Von Dr. GEORG SCHEFFERS. Zweite verbesserte Auflage. Leipzig, Veit, 1911. 8vo. vi+732 pp.

IMAGINE a course of some 150 lectures on algebra, trigonometry, analytic geometry, and calculus given by a sound mathematician and an excellent teacher, not lacking in the sense of humor. Imagine the audience to be students of general science or engineering who have taken the usual secondary school courses in mathematics, "jedoch manches davon wieder vergessen, vielleicht auch manches davon nicht ganz verstanden haben." (From the preface.) Imagine these lectures together with all side remarks, illustrations and black-board drawings and sketches taken down word for word by a good stenographer, whose notes are transcribed and published in a large octavo volume by a first rank Leipzig firm. Imagine all this and from one point of view the reader will have a good idea of the book under review.

The word "function" dominates the plan of the work. If we call our usual division of college mathematics into algebra, trigonometry, analytic geometry, and calculus a horizontal division, we might call Scheffers' division a vertical one. Beginning with the notion of a function, he takes up one after the other, linear, quadratic, rational integral, rational, logarithmic, exponential, and trigonometric functions. An outline of his chapter on the quadratic function will give an idea of his method of treatment. The graph of the function is discussed in great detail, beginning with the simple case  $x^2$  and then taking up more complicated cases with numerical

coefficients, gradually leading up to a discussion of the graph of  $ax^2 + bx + c$  and the changes due to letting one or more of the coefficients vary. Then the idea of "slope" at a point, which had been previously discussed in connection with the linear function, is taken up and leads to a general discussion of limits, and in particular to the derivative of the quadratic function.

In a general way the chapters on the other functions follow a similar plan and integration is gradually introduced. At the end of the chapter on the rational function a chapter, "Einiges aus der analytischen Geometrie," rounds out the course in analytic geometry which has been running through the previous chapters, though polar coordinates are not discussed until the graph of the logarithmic spiral is taken up. The chapter on trigonometric functions, while lacking the solution of triangles, is more complete than our usual freshman course.

After the chapter on trigonometry, which finishes the first half of the volume, the author swings into a regulation course in calculus, and from this point on the matter is given more in the usual text-book manner, including the topics generally given in connection with functions of one and of more than one variable. However the genial conversational style is used to the end of the last chapter.

This book is one of the best examples of a class of books common in Germany but rare in this country, i. e., a book written especially to be used without a teacher. The author in his preface refers to it as, "Lehrbuch für Anfänger und solche, die es bleiben wollen." It is a mine of interesting problems, which if not all applied problems are at least clothed in the language of applications. At some points in the early chapters the weight of detail is so marked that the author takes it upon himself to advise the better class of students to skip a few pages and provides rather complete summaries and "Rückblicke" for their use. At the end of the book a few tables are given, among them a table of integrals, and one of hyperbolic functions. The work will be very interesting to those teachers who are interested in the problem of combining our freshman and sophomore courses into one harmonious "course in mathematics."

A. R. CRATHORNE.