May this be a pioneer, not only in the subject which it represents, but also in the publication of accurate works on advanced mathematical topics in America.

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THE UNIVERSITY OF MISSOURI,
COLUMBIA, MO.,
August, 1905.

TWO BOOKS ON ANALYTIC GEOMETRY.

The Elements of Analytic Geometry. 8vo. 424 pp. *Introduction to Analytic Geometry.* 8vo. 217 pp. By PERCEY F. SMITH and ARTHUR SULLIVAN GALE. New York, Ginn and Company, 1904.

It is a good sign for the university instruction in mathematics of the day that text-books are appearing more frequently in series than formerly. As a rule it means a better individual text-book, for it is the attempt of not one, but several members of the department collaborating to meet in the best possible way what actual experience has taught them to be the need of the student; and it certainly means a more organic, better coördinated mathematical curriculum in the institution which properly uses them. There is furthermore a considerable time economy for the student in the use of such a series. Take for instance the subjects : functions, graphs, partial fractions, and so forth, occurring in different lights in algebra, analytic geometry and calculus; considerable space and time can be gained in their second and subsequent treatments. Still another important gain is to be found in the clearing away for the student of all non-essential difficulties of a new subject, such as becoming accustomed to a new style, a new method of exposition, or a new notation. The books before us are two of a series called into being by needs at Yale University and now appearing under the editorial direction of Professor P. F. Smith.

In those of the works which are at present complete, the main object seems to have been to create drill books, which should be clear and minute in the exposition and analysis of method and rich in exercises, so that a course in one of them would leave the student a ready master of the more usual problems of the subject. If this is a correct conception of their

aim, it has been admirably attained. Each bit of theory is immediately followed by a number of illustrative examples worked out in detail ; these are followed by an analysis of the method used in the form of a set of two or three " working rules " for obtaining the required results ; then comes a well-stocked and judiciously chosen set of exercises. Some of the special features of the books are well enumerated in the little announcements distributed by the publishers and need not be commented upon here. As the " Introduction " is built upon the first nine chapters of the " Elements " we may perhaps do best to touch first upon the topics common to both books, and then add a few words about the " Elements."

In looking over a new analytic geometry one usually turns straight to the chapter on locus and equation, as the vital part of the whole subject. In these books the chapter does not start by considering indeterminate equations and interpreting them geometrically as a series of points lying on a curve of given type, but proposes and attacks the problem of finding the equation of a given geometric locus at once. The " rule " formulated is fundamental and ought to be in every text book on the subject. An interesting point in this chapter is this : If a given equation the nature of whose locus it is required to discuss is seen to be a special case of a more general equation previously discussed, its locus is a special case of the general locus — this fact is made a principle, and called the "principle of comparison." It is an example of the detail with which the paths of thought are mapped out for the student. Indeed, if the books have any salient fault, it is this spirit of doing so much for the pupil, leaving him to do rather little thinking for himself and reducing nearly everything to mechanical rule.

Although the conic sections occupy a position avowedly secondary to the general methods of analytic geometry, they receive a systematic discussion in a separate chapter. The general equation of the conic is first derived in polar coördinates in terms of eccentricity and distance of focus from directrix. The forms of the special conics are then discussed, first the parabola, then the ellipse and hyperbola in parallel columns. The equations are then reduced to their simplest forms in rectangular coördinates. The more important properties of the conics and systems of conics are considered, and a general method is given for reducing and plotting the locus of the general equation of the second degree.

Tangents and normals receive discussion in a separate chapter, and the analytic geometry of space is treated in the two concluding chapters as a direct generalization of the developments for the plane.

The " Elements," while designed to meet the needs of the same class of students as the shorter book, constitutes a somewhat longer course, and is sufficiently rich in material to allow of considerable latitude of choice. A valuable chapter is added on equations in parametric form, also one on invariants of the quadric with respect to motions of the plane, one on euclidean transformations, one on inversion, one on poles and polars, including polar reciprocation, and the analytic geometry of space receives a much fuller treatment. The chapter on " Line and quadric " treats of tangent lines and planes, diametral and polar planes, and circumscribed and asymptotic cones.

The general appearance of the book is exceedingly attractive. A variety of styles of type has been skillfully used to make clear the different characters of various parts of the text, as theorem, proof, rule, and example. The figures are excellent, clear and distinct, and mention should be made of the half-tones of models of quadric surfaces toward the end of the books, which will do a great deal in helping the student to a correct idea of these surfaces.

No estimate of a book can be quite satisfactory without a basis of class-room experience; but these two books certainly merit a trial, especially in institutions where the needs of the students are similar to those at Yale University.

<div style="text-align:right">O. D. KELLOGG.</div>

PRINCETON, N. J.,
　July 25, 1905.

<div style="text-align:center">NOTES.</div>

THE German mathematical society held its annual meeting, in affiliation with the association of German scientists and physicians, at Meran, Tyrol, September 24–30. Twenty-seven titles were announced on the preliminary programme, including reports " On the introduction of the calculus in the gymnasia," by Professor E. CZUBER; " On partial differential equations of physics," by Professor W. WIEN; " New investigations of Riemann's ζ-functions," by Dr. P. EPSTEIN; " The status of