Higher Geometry. An Introduction to Advanced Methods in Analytic Geometry. By Frederick S. Woods. Boston, Ginn and Co., 1922. x + 423 pp.

This book makes available in one volume material collected from many books and memoirs. The wide scope of the book can only be indicated by noting the topics treated. Its plan is to treat in succession geometries of one, two, three, and four or more dimensions, the later treatments serving, although at the expense of a little repetition, to go over the general method of treatment again and again.

Part I introduces the ideas of coordinates, duality, imaginaries, infinity, transformations, and groups in a total of seven pages, after which cartesian and projective coordinates of a one-dimensional form, linear transformations, crossratio, harmonic sets, projection, etc. follow rapidly.

Part II, on two-dimensional geometry, introduces homogeneous cartesian point coordinates, trilinear point coordinates, line coordinates, curves in point and line coördinates, linear transformations including their classification by means of geometric properties, projective measurement with the resulting classification of geometries as hyperbolic, elliptic, or parabolic, contact transformations, tetracyclical coordinates, etc.

Part III, on three-dimensional geometry, starts with circle geometry on a plane and continues later with the usual point and plane coordinates in three-space, with treatment of surfaces, geometric classification of collineations and pentaspherical coordinates.

Part IV, on geometry of four and higher dimensions, starts with Plücker's coordinates for lines in ordinary spaces. Sphere coordinates are then treated in detail, with the dualistic relation between line-space and sphere-space. The ordinary four-dimensional point coordinates and a brief consideration of n-dimensional geometry conclude the book.

While it is stated in the preface that the prerequisites are only the elementary courses in analytic geometry and calculus with a slight knowledge of determinants, the reviewer believes that, on account of the large number of new ideas involved, it would have to be diluted and supplemented, even for the ordinary class of seniors and beginning graduates. To understand it, some maturity and some familiarity with the abstract point of view would seem to be necessary.

The book has no definite references to original sources, and no effort is made to connect up with the various books on foundations of mathematics. Also more explicit statements of hypotheses would be helpful to the immature reader who is in danger of making erroneous assumptions.

In spite of the above criticisms, the book is the most stimulating work in geometry that the reviewer has read in years, and it forms a most important addition to the literature of the subject.

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