

ECLECTIC EDUCATIONAL SERIES.

A TREATISE
ON
ANALYTIC GEOMETRY,

ESPECIALLY AS APPLIED TO

THE PROPERTIES OF CONICS:

INCLUDING THE MODERN METHODS OF ABRIDGED NOTATION.

WRITTEN FOR THE MATHEMATICAL COURSE OF
JOSEPH RAY, M.D.,

BY
GEORGE H. HOWISON, M.A.,
PROFESSOR IN WASHINGTON UNIVERSITY.

CINCINNATI:
WILSON, HINKLE & CO.
PHILA: CLAXTON, REMSEN & HAFFELFINGER.
NEW YORK: CLARK & MAYNARD.

Entered, according to Act of Congress, in the year 1869, by
WILSON, HINKLE & CO.,
In the Clerk's Office of the District Court of the United States, for the
Southern District of Ohio.

ELECTROTYPED AT THE
FRANKLIN TYPE FOUNDRY,
CINCINNATI.

PREFACE.

IN preparing the present treatise on Analytic Geometry, I have had in view two principal objects: to furnish an adequate introduction to the writings of the great masters; and to produce a book from which the topics of first importance may readily be selected by those who can not spare the time required for reading the whole work. I have therefore presented a somewhat extended account of the science in its latest form, as applied to Loci of the First and Second Orders; and have endeavored to perfect in the subject-matter that natural and scientific arrangement which alone can facilitate a judicious selection.

Accordingly, not only have the equations to the Right Line, the Conics, the Plane, and the Quadrics been given in a greater variety of forms than usual, but the properties of Conics have been discussed with fullness; and the Abridged Notation has been introduced, with its cognate systems of Trilinear and Tangential Co-ordinates. On the other hand, to facilitate selection, these modern methods have been treated in separate chapters; and, in the discussion of properties, distinct statement, as well as natural grouping, has been constantly kept in view.

It is to be hoped, however, that omissions will be avoided rather than sought, and that the modern methods, which are here for the first time presented to the American student, may awaken a fresh interest in the subject, and lead to a wider study of it, in the remarkable properties and elegant forms with which

PREFACE.

it has been enriched in the last fifty years. The labors of PONCELET, STEINER, MÖBIUS, and PLÜCKER have well-nigh wrought a revolution in the science; and though the new properties which they and their followers have brought to light, have not yet received any sufficient application, nevertheless, in connection with the elegant and powerful methods of notation belonging to them, they constitute the chief beauties of the subject, and have very much heightened its value as an instrument of liberal culture.

To render the book useful as a work of reference, has also been an object. In the Table of Contents, a very full synopsis of properties and constructions will be found, which it is hoped will meet the wants, not only of the student in reviewing, but of the practical workman as well.

In the demonstrations, convenience and elegance have been aimed at, rather than novelty. When it has seemed preferable to do so, I have followed the lines of proof already indicated by the leading writers, instead of striking out upon fresh ones. My chief indebtedness in this respect, is to the admirable works of Dr. GEORGE SALMON. The treatise of Mr. Todhunter has furnished some important hints; while those of O'Brien and Hymers have been often referred to. For examples, I have drawn upon the collections of Walton, Todhunter, and Salmon. Of American works, those of Peirce and Church have been consulted with advantage.

To Professor William Chauvenet, Chancellor of Washington University, formerly Head of the Department of Mathematics in the United States Naval Academy, I am indebted for many valuable suggestions.

H.

WASHINGTON UNIVERSITY, }
St. Louis, Sept., 1869. }

NOTE TO SECOND EDITION.

At the suggestion of several instructors, I place here an **OUTLINE OF THE COURSES OF STUDY** which seem to me most judicious in using the present treatise.

MINIMUM COURSE.

BOOK I, PART I. ARTS. 1—6; 13—28; 46—64; 74—85; 95, 96, 98, 99; 101—103; 106; 133—138; 145—152; 165—172; 179—184.

BOOK II, PART I. ARTS. 293—305; 310—317; 351—357; 359—372; 376; 379—385; 389—392; 402—406; 411—413; 416—418; 421, 422; 427—429; 442—444; 446—454; 456—469; 473; 476—481; 485—488; 497—501; 506, 507, 510, 511, 514, 515; 520—522; 535—543; 546—550; 553—557; 559—576; 579—586; 594—609; 622—634.

BOOK II. ARTS. 674—690, including the general doctrine of Space-coördinates and of the Plane.

To these articles there should be added such a selection from the Examples as the Course implies. The Course will thus include about 210 pages.

INTERMEDIATE COURSE.

This Course is what I suppose the leading Colleges will be most likely to pursue, and should therefore include

THE INTRODUCTION. ARTS. 1—6; 13—45.

BOOK FIRST, PART I. Chapter I.

PART II, Chapter I to Art. 274. Chapter II to Art. 332, omitting, however, Arts. 307, 324—327. Chapters III—V, omitting Articles in fine type. Chapter VI to Art. 670.

BOOK SECOND. Chapter I. Chapter II, Arts. 713, 714; 731—741.

THE FULL COURSE

Is intended for such students as desire to make Mathematics a specialty; and students in Schools of Technology will naturally read the whole of Book Second, even when they omit large portions of Book First.

THE AUTHOR.