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ANALYTIC GEOMETRY

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PREFACE

In accordance with the general plan of this series of textbooks, the authors of the present volume have had constantly in mind the needs of the student who takes his mathematics primarily with a view to its applications as well as the needs of the student who pursues mathematics as an element of his education.

The processes of analytical geometry find their application, for the most part, in the scientific laboratory where it is often necessary to study the properties of a function from certain observed values. The fundamental concept is, therefore, that of functional correspondence and the methods of representing such correspondence geometrically. For this reason rather more than usual attention has been given to these subjects (Chapter III; also Chapter IX, Arts. 135 to 140).

An intelligent appreciation of functional correspondence requires an intimate knowledge of the relation between an equation and the graphical representation of the functional correspondence determined by the equation. Such a knowledge is most easily obtained by a study of linear equations and equations of the second degree together with their corresponding loci. This knowledge is not only of importance to the student of applied mathematics, but it has a special disciplinary value for the general student.

The standard forms of the equations of a number of important loci are developed early (Chapter IV), and the properties of these loci are discussed in detail later (Chapters VI and VII) by means of the equations already at hand. By this arrangement, it is hoped that some unnecessary repetition has been avoided.

The equations of tangents to the conic sections have been derived by means of the discriminant of the quadratic equation whose roots are the x-coördinates of the points of intersection with a variable secant, rather than by means of the derivative. This course has been adopted, first, because the geometric inter-

pretation of the discriminant is important in itself; and, second, because the use of the derivative ought, logically, to be preceded by a chapter devoted to its definition and the methods for finding it, at least for algebraic functions. Moreover, the use of the derivative for finding the equations of tangents is only one of its many applications. No student should feel that his mathematical education is complete without a knowledge of the calculus, where he will become familiar with the derivative and can appreciate its usefulness in many directions.

The present volume is designed for a four-hour, or a five-hour, course for one semester, but may be shortened to a three-hour course by omitting certain parts of the text. For example, Art. 105 may be omitted without marring the continuity of the course. Again, Arts. 110, 111, and 112 contain all that is essential in dealing with the general equation of the second degree in two variables, and the remainder of Chapter VIII can therefore be omitted from the longer course. Parts of Chapter IX can also be omitted according to the needs of the student. The chapters on solid analytic geometry have been added for the benefit of those students who have time only for an outline of the subject matter. No apology is therefore offered for the meager treatment.

The authors desire to express their appreciation to their colleagues of the University of Wisconsin and of the University of Illinois for the assistance and the many helpful suggestions given them during the preparation of the book. They are under especial obligations to Professor W. H. Bussey, of the University of Minnesota; Professor S. C. Davisson, of the University of Indiana; Professor J. L. Markley, of the University of Michigan; and Professor E. J. Townsend, of the University of Illinois, for their care and assistance in seeing the book through the press.

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UNIVERSITY OF WISCONSIN,
July, 1914.

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