

**DUBLIN UNIVERSITY PRESS SERIES. A  
COLLECTION OF EXAMPLES ON THE  
ANALYTICAL  
GEOMETRY OF PLANE CONICS: TO  
WHICH ARE ADDED SOME EXAMPLES  
ON SPHERO-CONICS. PP. 1-211**

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**RALPH A. ROBERTS**

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A COLLECTION OF EXAMPLES

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ANALYTIC GEOMETRY OF PLANE CONICS;

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*SOME EXAMPLES ON SPHERO-CONICS.*

BY

RALPH A. ROBERTS, M.A.,

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## PREFACE.

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A PART of this collection of examples has been published by me before in a *Collection of Examples and Problems on Conics and some of the Higher Plane Curves*. In this volume I have added a good many more examples, besides giving solutions of the more difficult ones which were left unsolved. I believe that either the examples themselves, or the methods of their solution, are to a great extent original.

A large number of the examples contain properties of circles connected with a conic, and especially of those which have double contact with the curve. In proving the properties of the latter systems of circles I have made frequent use of their differential equations in elliptic co-ordinates, the given curve being one of the system of confocal conics. In the same co-ordinates I have also made use of the differential equations of the tangents to a conic, and the systems of conics having double contact with two fixed confocal conics. The method of elliptic co-ordinates simplifies greatly the study of relations involving the angles of intersection of such systems, whose differential equations take a simple form.

I have added a section on Sphero-Conics at the end of the book. Most of these examples are extensions of results already obtained for the case of the plane curves. I have again here made a free use of elliptic co-ordinates.

I have assumed the reader to be familiar with Dr. Salmon's *Conic Sections*, and have constantly made references throughout to that work. I have also occasionally referred to his works on the *Higher Plane Curves*, and *Geometry of Three Dimensions*.

*March, 1884.*