ELEMENTS OF GEOMETRY AND CONIC SECTIONS

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649108510

Elements of geometry and conic sections by Elias Loomis

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ELIAS LOOMIS

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AND

CONIC SECTIONS.

BY ELIAS LOOMIS, LLD.,

PROFESSOR OF NATURAL PHILOSOPHY AND ARTRONOMY IN TALE COLLEGE, AND AUTHOR OF A "COURSE OF NATHEMATICS."

TWENTY-EIGHTH EDITION.

NEW YORK:

HARPER & BROTHERS, PUBLISHERS
329 & 331 PEARL STREET,
(FRANKLIN SQUARE)

Entered, according to Act of Congress, in the year 1858, by

Elias Loomts,

In the Clerk's Office of the Southern District of New York.

TO THE

HON THEODORE FRELINGHUYSEN, LLD,

CHANCELLOR OF THE UNIVERSITY OF THE CITY OF NEW YORK.

THE PRIEND OF EDUCATION, THE PATRIOT STATESMAN,

AND THE CHRISTIAN PHILANTHROPIST,

This Work

IS RESPECTFULLY DEDICATED

BY

THE AUTHOR.

PREFACE.

In the following treatise, an attempt has been made to combine the peculiar excellencies of Euclid and Legendre. The Elements of Eucli have long been celebrated as furnishing the most finished specimens or logic; and on this account they still retain their place in many seminaries of education, notwithstanding the advances which science has made in modern times. But the deficiencies of Euclid, particularly in Solid Ge ometry, are now so palpable, that few institutions are content with a simple translation from the original Greek. The edition of Euclid chiefly used in this country, is that of Professor Playfair, who has sought, by additions and supplements, to accommodate the Elements of Euclid to the present state of the mathematical sciences. But, even with these additions, the work is incomplete on Solids, and is very deficient on Spherical Geometry. Moreover, the additions are often incongruous with the original text; so that most of those who adhere to the use of Playfair's Euclid, will admit that something is still wanting to a perfect treatise. At most of our colleges, the work of Euclid has been superseded by that of Legendre. It seems superfluous to undertake a defense of Legendre's Geometry, when its merits are so generally appreciated No one can doubt that, in respect of comprehensiveness and scientific errangement, it is a great improvement upon the Elements of Euclid. Nevertheless, it should ever be borne in mind that, with most students in our colleges, the ultimate object is not to make profound mathemati cians, but to make good reasoners on ordinary subjects. In order to secure this advantage, the learner should be trained, not merely to give the outline of a demonstration, but to state every part of the argument with minuteness and in its natural order. Now, although the model of Legendre is, for the most part, excellent, his demonstrations are often mere skeletons. They contain, indeed, the essential part of an argument; but the general student does not derive from them the high est benefit which may accrue from the study of Geometry as an exercise in reasoning.

While, then, in the following treatise, I have, for the most part, fol owed the arrangement of Legendre, I have aimed to give his demonstrations somewhat more of the logical method of Euclid. I have also made

some changes in arrangement. Several of Legendre's propositions have been degraded to the rank of corollaries, while some of his corollaries a scholiums have been elevated to the dignity of primary propositions *Iis lemmas have been proscribed entirely, and most of his scholiums have received the more appropriate title of corollary. The quadrature a the circle is developed in an order somewhat different from any thing I have elsewhere seen. The propositions are all enunciated in general terms, with the utmost brevity which is consistent with clearness; and, in order to remind the student to conclude his recitation with the enun ciation of the proposition, the leading words are repeated at the close of each demonstration. As the time given to mathematics in our colleges is limited, and a variety of subjects demand attention, no attempt has been made to render this a complete record of all the known propositions of Geometry. On the contrary, nearly every thing has been excluded which is not essential to the student's progress through the subsequent parts of his mathematical course.

Considerable attention has been given to the construction of the dia graps. I have aimed to reduce them all to nearly uniform dimensions, and to make them tolerable approximations to the objects they were do signed to represent. I have made free use of dotted lines. Generally, the black lines are used to represent those parts of a figure which are directly involved in the statement of the proposition; while the dotted lines exhibit the parts which are added for the purposes of demonstration. In Solid Geometry the dotted lines commonly denote the parts which would be concealed by an opaque solid; while in a few cases, for peculiar reasons, both of these rules have been departed from. Throughout Solid Geometry the figures have generally been shaded, which addition, it is hoped, will obviate some of the difficulties of which students frequently complain.

The short treatise on the Conic Sections appended to this volume is designed particularly for those who have not time or inclination for the study of Analytical Geometry. Some acquaintance with the properties of the Ellipse and Parabola is indispensable as a preparation for the study of Mechanics and Astronomy. Those who pursue the study of Analytical Geometry can omit this treatise on the Conic Sections if it should be thought desirable. It is believed, however, that some knowledge of the properties of these curves, derived from geometrical methods, forms an excellent preparation for the Algebraical and more general processes of Analytical Geometry.

CONTENTS

	P	LA	NE	GE	ом	ET	RY.				
	1000		magg.	001							
General Principles	1000	÷				100	72	lia.	112	99	145
O-BOLEN I IMOLPINA				OOF		e e	11.5		1100		
Datio and Departi	O.D.		ь	001	٠.,	Š.		112	772	200	36
Ratio and Proportion	on									200	
	***	00000	22	оок	0.000	1.					. 44
The Circle, and the	e Mca	surc				22	8				110.75
	2000000		В	0 O K	I	9					. 57
The Proportions of	f Figu	res				*	3.	•	•		
			5-01-3	001							(0,0
Problems relating	to the	pre	cedin,	g Bool	13		-	•		+11	. 82
			В	OOR	v	L.					
Regular Polygons,	and t	he A	rea o	f the	Circl	e.	8	3.5	$(0, \bullet, 0)$		98
			0.000	2000.00	20000	nerener Serveren					
	5	10	ID	GE	ОМ	ET	RT				
			В	оок	V)	I.					
Planes and Solid	Angles		114	•						•	. 112
			в	ок	VI	IL					
Polyedrons .	22.4	33	5150500 02.40	10 * 75	0000000 111 • 11		1.00				. 127
			В	008	(1:	x.					
Spherical Geomet	rv	9.2		10000000			•60			•0	. 148
		-		300							
The Three round	Rodio	anere.		,				1		4.0	. 164
and Inico Iouna	20010					•		3.77			20.00000
		co	NIC	SE	CO	rio	NS.			15	
Parabola	49 62	OC.		702 C	100	estrati joi	4.8000 33	90	4	20	. 177
Ellipse	•	200	10967	27. 6 20	60	***	•33	20		#0.	. 188
Hyperbola .	4		•				•				. 205

N.B.—When reference is made to a Proposition in the same Book, only the number of the Proposition is given; but when the Proposition is found in a different Book, the number of the Book is also specified