GRAPHICAL METHODS

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649510191

Graphical Methods by Carl Runge

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

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GRAPHICAL METHODS

Trieste

Columbia University Lectures

GRAPHICAL METHODS

ERNEST KEMPTON ADAMS RESEARCH FUND

1909-1910

COLUMBIA
UNIVERSITY PRESS
SALES AGENTS

NEW YORK:
LEMCKE & BUECHNER
30–32 WEST 27TH STREET

LONDON:
HENRY FROWDE
AMEN CORNER, E.C.

TORONTO:
HENRY FROWDE
25 RICHMOND STREET, W.

COLUMBIA UNIVERSITY LECTURES

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FOR THE YEAR 1909–1910

New York
COLUMBIA UNIVERSITY PRESS
1912

PRESS OF
THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

TABLE OF CONTENTS.

INTRODUCTION.

§ 1. A great many if not all of the problems in mathematics may be so formulated that they consist in finding from given data the values of certain unknown quantities subject to certain conditions. We may distinguish different stages in the solution of a problem. The first stage we might say is the proof that the quantities sought for really exist, that it is possible to satisfy the given conditions or, as the case may be, the proof that it is impossible. In the latter case we have done with the problem. Take for instance the celebrated question of the squaring of the circle. We may in a more generalized form state it thus: Find the integral numbers, which are the coefficients of an algebraic equation, of which π is one of the roots. Thirty years ago Lindemann showed that integral numbers subject to these conditions do not exist and thus a problem as old almost as human history came to an end. Or to give another instance take Fermat's problem, for the solution of which the late Mr. Wolfskehl, of Darmstadt, has left $25,000 in his will. Find the integral numbers x, y, z that satisfy the equation

$$x^n + y^n = z^n,$$

where n is an integral number greater than two. Fermat maintained that it is impossible to satisfy these conditions and he is probably right. But as yet it has not been shown. So the solution of the problem may or may not end in its first stage.

In many other cases the first stage of the solution may be so easy, that we immediately pass on to the second stage of finding methods to calculate the unknown quantities sought for. Or even if the first stage of the solution is not so easy, it may be expedient to pass on to the second stage. For if we succeed in finding methods of calculation that determine the unknown quan-