DIFFERENTIAL AND INTEGRAL CALCULUS FOR BEGINNERS: ADAPTED TO THE USE OF STUDENTS OF PHYSICS AND MECHANICS

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EDWIN EDSER

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Adapted to the use of Students of Physics and Mechanics

BY

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PREFACE.

IN commencing the study of advanced theoretical physics, students frequently find themselves hopelessly handicapped by their lack of knowledge of the higher mathematics. Most of the text-books on the Differential and Integral Calculus are unsuited to afford material assistance, being far too full and detailed in some respects, and deficient or entirely wanting in others. In order to assist students labouring under these difficulties, a series of articles was commenced in the pages of *The Practical Teacher* in the month of April 1898. In these it was sought to explain the essential principles of the Calculus shorn of all extraneous difficulties, and to lead the student by natural and easy stages to the application of these principles to important problems in mechanics and physics.

Letters received from time to time from a great variety of students showed that these articles met a real want, and it was ultimately decided to amplify and extend them, and publish them in book form. The present volume is the result of that decision.

In the following pages no attempt has been made to develop the subject as a branch of abstract mathematics; the aim has been to provide the physical student with a valuable engine of research, and to accustom him to its use. Many discussions found in larger treatises will, therefore, be unmentioned in the present work, as possessing no interest from a physical point of view. Lack of space must serve as an excuse for the omission of a few elementary investigations which possess a real value to the physical student.

The subject-matter has been arranged so that, though possessing no mathematical attainments further than a sound knowledge of elementary algebra and geometry, the student should find no difficulties which cannot be overcome by application and perseverance. The general nature of the most important functions is treated of in the opening chapter; an appendix gives a short synopsis of the trigonometrical formulæ subsequently used, with their proofs. By this means reference to other books is rendered unnecessary. The significance of a differential coefficient is then explained on geometrical grounds, and it is shown how a knowledge of the binomial theorem and a few trigonometrical formulæ can be used to obtain the differential coefficient of any function. Applications to maxima and minima problems, and the expansion of functions, are then given. Incidentally the student is introduced to the geometry of complex quantities.

The method of obtaining the integral of a function is explained on grounds more simple than those generally employed, and numerous applications to geometrical, mechanical, and physical problems are then given. In each case a short explanation of the nature of the problem in hand is provided, so that its physical aspect may be kept clearly in view throughout the investigation. Most of the problems chosen possess intrinsic importance; a few have been selected in order to show the use of particular mathematical devices.

The concluding chapter, on differential equations, though necessarily incomplete, should prove useful to the student as an introduction to a most important branch of mathematics. The increasing importance of hyperbolic functions in physical investigations renders any apology for introducing a short discussion of their properties unnecessary.

I am pleased to have this opportunity of returning my thanks to Mr. W. P. Workman, M.A., who has kindly read through the proofs of this book, for his helpful criticisms and suggestions.

DAVY-FARADAY LABORATORY,
ROYAL INSTITUTION,
October 1900.

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