BOOK REVIEW

AN INTRODUCTION TO THE MATHEMATICS OF MEDICINE AND BIOLOGY. By J. G. Defares and I. N. Sneddon. Pp. xii + 663 (including Index). North-Holland Publishing Company, Amsterdam, 1960. 85s.

This book has been produced primarily for the research worker in the biological sciences and for the research minded clinician, it is written on the assumption that most readers have ceased the active study of mathematics. The theory of statistics is not treated although the mathematics required has been included.

The book opens with a chapter on algebraic preliminaries, which should not cause any reader too much difficulty; this deals with number systems, indices, logarithms, series, binomial theorem, approximations and partial fractions. Problems to which answers are given are contained in all chapters.

The second chapter concerns functions of a single variable; the relationship between algebraic functions and graphs is discussed fully. The trigonometrical functions are introduced together with the graphs of these functions. Many examples are drawn from physiological and medical research.

Chapter three is entitled 'limits and derivatives' and provides the foundation for differential calculus. The treatment is mainly formal but a few biological examples are given. Chapter four develops the rules for algebraic integration. Chapter five introduces integration as a geometrical concept of area and then proceeds to algebraic integration. The treatment is clearly set out and is thorough, perhaps a little too thorough for the purpose for which the book is written. Chapter six deals with logarithms and exponential functions and has an interesting section on the applications of these functions in biology.

Chapter seven on techniques of integration is long and comprehensive, dealing with such methods as successive reduction of integrals and the use of gamma functions. The integrals associated with the theory of statistics are discussed, and there are sections on the Laplace transform and on the use of tables of integrals.

Chapter eight deals with functions of more than one variable. It is mainly concerned with partial derivatives and illustrates their application to the calculation of small errors arising from several sources and to the theory of thermodynamics. There is a section on double integration and also a discussion on the meaning of entropy as employed in cybernetics.

Chapter nine is on differential equations and is again comprehensive and advanced. Higher degree equations and symbolic operators are treated and there are sections on partial differential equations such as the wave and diffusion equations. The use of Fourier series and other methods for solving these equations, are described.

In the final chapter which is entitled "further applications to medicine and biology", the differential equations arising in the consideration of topics such as the form of the arterial pulse, the uptake of K^{42} by human erythrocytes, the growth of isolated populations, the oxygen debt, forced and damped oscillations, the time course of pupil contractions during illumination and theories of nervous excitation, are considered.

There is an appendix on determinants which defines them and develops some of their properties without, however, illustrating their application.

Altogether this is a lucidly written advanced textbook in mathematics and it is copiously illustrated with biological and medical examples. The reader who works his way through this book will be well prepared to interpret experimental results in quantitative biology. The book helps to show the way in which courses in mathematics for biology should be developed so as to become a more important part of the training of students in biology and medicine.

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