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Abstract

The content of this book constitutes a unified presentation of concepts, methods, and results from Ordinary Differential Equations, Complex Functions, and Fourier Transformations, within which general frameworks are formulated, interpreted, and analyzed in various significant applications in the natural and technological sciences, as well as in computer science. The book is divided into three parts: I. Ordinary Differential Equations, II. Complex Functions, and III. Series and Fourier Transformations. Ordinary Differential Equations represent an extensive field in both pure and applied mathematics, focusing on the study of existence and uniqueness of solutions in pure mathematics and emphasizing computational methodologies in applied mathematics. Differential Equations also play a crucial role in mathematical modeling of physical, technological, and biological processes. The theory of Complex Functions is one of the most fascinating areas of mathematics. Many of the most powerful techniques used to formulate and study applications of mathematics in other sciences are based on the theory of Complex Functions. One of the purposes of the book is to present a wide range of applications and to comprehensively process techniques of Complex Functions that are used for their modeling. The concept of the Fourier Transformation consists of an integral representation of functions and is an extension of the representation of functions with the help of Fourier series. Fourier Transformations have many applications in the natural sciences and technology and are practically used for the transformation of functions between the fields of time or space and the field of frequencies.

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