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内容概要

Special functions, natural generalizations of the elementary functions, have been studied for centuries. The greatest mathematicians, among them Euler, Gauss, Legendre, Eisenstein, Riemann, and Ramanujan, have laid the foundations for this beautiful and useful area of mathematics. For instance, Euler found the gamma function, which extends the factorial. The Bessel functions and Legendre polynomials play a role in three dimensions similar to the role of sine and cosine in two dimensions. This treatise presents an overview of special functions, focusing primarily on hypergeometric functions and the associated hypergeometric series, including Bessel functions and classical orthogonal polynomials. The basic building block of the functions studied in this book is the gamma function. In addition to relatively new work on gamma and beta functions, such as Selberg ’s multidimensional integrals, a number of important but relatively unknown nineteenth century results are included. The authors discuss Wilson ’s beta integral and the associated orthogonal polynomials. Some q -extensions of beta integrals and of hypergeometric series are presented with Bailey chains employed to derive some results. An introduction to spherical harmonics and applications of special functions to combinatorial problems are included. The book also desls with finite field versions of some beta integrals. The authors provide organizing ideas, motivation, and historical backgroud for the study and application of some important special functions. This clearly expressed and readable work can serve as a learning tool and lasting reference for students and researchers in special functions, mathematical physics, differential equations, mathematical computing, number theory, and combinatorics.

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