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A modern classic, this clearly written, incisive textbook provides a comprehensive, detailed survey of the functions of mathematical physics, a field of study straddling the somewhat artificial boundary between pure and applied mathematics. In the 18th and 19th centuries, the theorists who devoted themselves to this field _ pioneers such as Gauss, Euler, Fourier, Legendre, and Bessel _ were searching for mathematical solutions to physical problems. Today, although most of the functions have practical applications, in areas ranging from the quantum-theoretical model of the atom to the vibrating membrane, some, such as those related to the theory of discontinuous groups, still remain of purely mathematical interest. Chapters One and Two examine orthogonal polynomials, with sections on such topics as the recurrence formula, the Christoffel-Darboux formula, the Weierstrass approximation theorem, and the application of Hermite polynomials to quantum mechanics. Chapter Three is devoted to the principal properties of the gamma function, including asymptotic expansions and Mellin-Barnes integrals. Chapter Four covers hypergeometric functions, including a review of linear differential equations with regular singular points, and a general method for finding integral representations. Chapters Five and Six are concerned with the Legendre functions and their use in the solutions of Laplace's equation in spherical coordinates, as well as problems in an n-dimension setting. Chapter Seven deals with confluent hypergeometric functions, and Chapter Eight examines, at length, the most important of these _ the Bessel functions. Chapter Nine covers Hill's equations, including the expansion theorems