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# Abstract

The field of mathematical analysis is constantly extending and the study of special functions is no exception. Special functions have centuries of history with immense literature and are known for their ambiguity and great applicability within mathematics as well as outside it. Special functions are the solutions of an enormous class of mathematically and physically applicable functional equations. In the present thesis, an effort has been made to study the "UTILIZATION OF HYPERGEOMETRIC FUNCTIONS IN RESOLVING SIGNIFICANT MATHEMATICAL ISSUES". The present thesis comprises of Ten Chapters. A brief summary of the problems is presented at the beginning of each chapter and then each chapter is divided into a number of sections.The Chapter 1, is related to brief survey of the literature and sufficiently deep. All the methods, techniques and theory are nicely presented which are used in the rest part of the thesis. In Chapter 2, the extensions and generalizations of Kummer's first summation theorem with suitable convergence conditions have been demonstrated. In Chapter 3, the extensions and generalizations of Kummer's second summation theorem with suitable convergence conditions have been derived. In Chapter 4, the extensions and generalizations of Kummer's third summation theorem with suitable convergence conditions have been deduced. In Chapter 5, the hypergeometric forms of some composite functions containing arcsine(x) and arccosine(x) have been obtained. Some applications of the functions are also obtained in the form of the Chebyshev polynomials and the Chebyshev functions. In Chapter 6, the Grobner-Hofreiter-type integrals and similar integrals are evaluated using hypergeometric function approach. This Chapter also shows how to represent Weber and Anger type integrals using two-variable hypergeometric series. In Chapter 7, the summations of some infinite series have been demonstrated by using partial fraction method. Moreover some novel hypergeometric summation theorems are also obtained. In Chapter 8, a hypergeometric generating function in the form of Srivastava-Daoust double hypergeometric function is derived using a closed form of reduction formula and series rearrangement technique. Moreover some results of Burchnall, Krall-Frink and Rainville are also obtained. In Chapter 9, the analytical expressions for the exact length of an arbitrary arc of hypocycloid have been given. Further, the formulas for exact curved surface areas of three dimensional figures are also established. In chapter 10, the analytical expressions for the exact lengths of an arbitrary arc of sine and cosine curves have been derived. Besides, the formulas for curved surface areas of the generated solid obtained by revolving the arbitrary arc and complete arc of sine and cosine curves about coordinate axes have been deduced.