

Abstract

Special functions are particular mathematical functions which arise in the solutions of various classical problems in physics. The functions are quite useful in mathematical analysis. Mostly, they find applications in applied mathematics, theoretical physics, and engineering. Special functions are usually uniquely described by a generating function, a Rodrigues' formula, and a recurrence relation. In this work, we derive analytical spherical Bessel-like functions corresponding to the infinite degree power series expansion of the functions obtained in the multipole series expansion of the Coulomb repulsion term. The convergence of the truncated power series expansion of the functions with the corresponding derived analytical functions, as well as the comparison of analytical functions of the first and second kinds, is analyzed. Rodrigues' formula and a recurrence relation for obtaining these analytical functions are also presented. It is shown that the higher order even and odd spherical Bessel-like functions of the first kind are derivable from the lowest order functions of the first and second kinds, respectively.