Recurrences for the coefficients of series expansions with respect to classical orthogonal polynomials

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Appl. Math. 29 (2002)

Abstract

Let $\{P_k\}$ be any sequence of the classical orthogonal polynomials. Further, let f be a function satisfying a linear differential equation with polynomial coefficients. We give an algorithm to construct, in a compact form, a recurence relation satisfied by the coefficients a_k in $f = \sum_k a_k P_k$.

A systematic use of the basic properties (including some non-standard ones) of the polynomials $\{P_k\}$ results in obtaining possibly low order of the recurrence.