Phillips, Timothy N.; Karageorghis, Andreas
On the coefficients of integrated expansions of ultraspherical polynomials. (English)

The main objective of the authors is to establish a relation between the coefficients in the expansions

\[ f^{(q)}(x) = \sum_{n=0}^{\infty} b_n p_n^{(\gamma,\gamma)}(x) \]  
\[ f(x) = \sum_{n=0}^{\infty} b_n^{(q)} p_n^{(\gamma,\gamma)}(x), \]

where \( p_n^{(\gamma,\gamma)} \) stands for the Gegenbauer polynomials while \( f(x) \) is an infinitely differentiable function defined on the interval [-1,1]. The importance of the relation given by the authors is that it involves only a finite number of coefficients, i.e.:

\[ b_n^{(q)} = \sum_{j=0}^{q} C_j b_{n-q+2j}, \]

which makes it appropriate in computing the numerical solutions to boundary-value problems. Notice that the cases \( \gamma = 0 \) and \( \gamma = - \) correspond to the expansions in Legendre and Chebyshev polynomials, respectively.

Reviewer: M.Idemen

MSC:

33C45 Orthogonal polynomials and functions of hypergeometric type (Jacobi, Laguerre, Hermite, Askey scheme, etc.)
65L10 Numerical solution of boundary value problems involving ordinary differential equations

Keywords:
spectral methods; Gegenbauer polynomials

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