Computer algebra for basic hypergeometric functions

06.06

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Abstract: With the exception of q-hypergeometric summation, the use of computer algebra packages implementing Zeilberger's holonomic systems approach in a broader mathematical sense is less common in the field of q-series and basic hypergeometric functions. As a case study, we look at the celebrated Ismail-Zhang formula, an important q-analog of a classical expansion formula of plane waves in terms of Gegenbauer polynomials, and demonstrate how the Mathematica package HolonomicFunctions can be employed to generate a computer-assisted proof of this identity. The HolonomicFunctions package was originally developed for dealing with classical special function identities (sums, series, integrals), but its range of applicability also includes q-series and q-orthogonal polynomials. This is joint work with Peter Paule.