Lifting q-difference operators in the Askey scheme of basic hypergeometric polynomials

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We construct an explicit form of a q-difference operator that lifts the continuous q-Hermite polynomials $H_n(x|q)$ of Rogers into the Askey-Wilson polynomials $p_n(x;a,b,c,d|q)$ on the top level in the Askey q-scheme. This operator represents a special convolution-type product of four one-parameter q-difference operators of the form $\epsilon_q(c_q D_q)$, defined as Exton's q-exponential function $\epsilon_q(z)$ in terms of the Askey-Wilson divided q-difference operator D_q. We show also that one can determine another q-difference operator that transforms the orthogonality weight function for the continuous q-Hermite polynomials $H_n(x|q)$ of Rogers up to the weight function, associated with the Askey-Wilson polynomials $p_n(x;a,b,c,d|q)$.

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