

The Bivariate Rogers-Szegö Polynomials

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Abstract: We present an operator approach to deriving Mehler's formula and the Rogers formula for the bivariate Rogers-Szegö polynomials $h_n(x, y|q)$. The proof of Mehler's formula can be considered as a new approach to the nonsymmetric Poisson kernel formula for the continuous big q -Hermite polynomials $H_n(x; a|q)$ due to Askey, Rahman and Suslov. Mehler's formula for $h_n(x, y|q)$ involves a $3\phi_2$ sum and the Rogers formula involves a $2\phi_1$ sum. The proofs of these results are based on parameter augmentation with respect to the q -exponential operator and the homogeneous q -shift operator in two variables. By extending recent results on the Rogers-Szegö polynomials $h_n(x|q)$ due to Hou, Lascoux and Mu, we obtain another Rogers-type formula for $h_n(x, y|q)$. Finally, we give a change of base formula for $H_n(x; a|q)$ which can be used to evaluate some integrals by using the Askey-Wilson integral.

Mathematics Subject Classification: 5A30, 33D45

Keywords: The bivariate Rogers-Szegö polynomials, the continuous big q -Hermite polynomials, the Cauchy polynomials, the q -exponential operator, the homogeneous q -shift operator

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