

Operational methods in the study of Sobolev-Jacobi polynomials

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Abstract: Inspired by ideas from umbral calculus and based on the two types of integrals occurring in the defining equations for the gamma and the reciprocal gamma functions, respectively, we develop a multi-variate version of the so-called umbral image technique. Besides providing a class of new formulae for generalized hypergeometric functions and an implementation of series manipulations for computing lacunary generating functions, our main application of these techniques is the study of Sobolev-Jacobi polynomials. Motivated by applications to theoretical chemistry, we moreover present a deep link between generalized normal-ordering techniques introduced by Gurappa and Panigrahi, two-variable Hermite polynomials and our integral-based series transforms. This is joint work with G. Dattoli (ENEA Frascati), G.H.E. Duchamp (Paris 13), Silvia Licciardi (ENEA Frascati) and K.A. Penson (Paris 6).