

Hypersymmetric Functions and Pochhammers of 2x2 Nonautonomous Matrices

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International Journal of Mathematics and Mathematical Sciences

vol. 2004, no. 59, pp. 3151-3170 (2004)

Abstract

We introduce the *hypersymmetric functions* of 2x2 nonautonomous matrices, and show that they are related, by simple expressions, to the Pochhammers (factorial polynomials) of these matrices. The *hypersymmetric functions* are generalizations of the *associated elementary symmetric functions*, and for a specific class of 2x2 matrices, having a high degree of symmetry, they reduce to these latter functions. This class of matrices includes rotations, Lorentz boosts, and discrete time generators for the harmonic oscillators.

The *hypersymmetric functions* are defined over four sets of independent indeterminates using a triplet of interrelated binary partitions. We work out the algebra of this triplet of partitions and then make use of the results in order to simplify the expressions for the *hypersymmetric functions* for a special class of matrices. In addition to their obvious applications in matrix theory, in coupled difference equations, and in the theory of symmetric functions, the results obtained here also have useful applications in problems involving successive rotations, successive Lorentz transformations, discrete harmonic oscillators, and linear two-state systems.