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Contractions of superintegrable systems and limits of orthogonal polynomials

In two dimension, all second-order superintegrable systems are limits of a generic system on the sphere. These limits in the physical systems correspond to contraction of the symmetry algebras generated by the integrals of the motion as well their function space representations. The action of these limits on the representation of the models gives the well known Askey-tableau of hypergeometric polynomials.

In this talk, we focus on the top of the tableau. That is, we will discuss in depth the contractions of the generic system on the sphere to the singular isotropic oscillator of Smorodinsky and Winternitz. These limits give the limits of Wilson polynomials to Hahn, dual Hahn and Jacobi polynomials. The physical limit gives a deeper understanding of the connection between the Hahn and dual Hahn polynomials. The general theory and outline of the tableau will be discussed in a later talk of W. Miller Jr.

This is joint work with W. Miller Jr. and E. Kalnins