The Kontorovich-Lebedev transform as a map between *d*-orthogonal polynomials

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Abstract

A slight modification of the Kontorovich-Lebedev transform is an automorphism on the vector space of polynomials. The action of this KL_{α} -transform over certain polynomial sequences will be under discussion, and a special attention will be given the d-orthogonal ones. For instance, the Continuous Dual Hahn polynomials appear as the KL_{α} -transform of a 2-orthogonal sequence of Laguerre type. Finally, all the orthogonal polynomial sequences whose KL_{α} -transform is a *d*-orthogonal sequence will be characterized: they are essencially semiclassical polynomials fulfilling particular conditions and *d* is even. The Hermite and Laguerre polynomials are the classical solutions to this problem.

Keywords: Index transforms, Kontorovich-Lebedev transform, *d*-orthogonal polynomials, semiclassical polynomials, Hermite polynomials, Laguerre polynomials, continuous dual Hahn polynomials.

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