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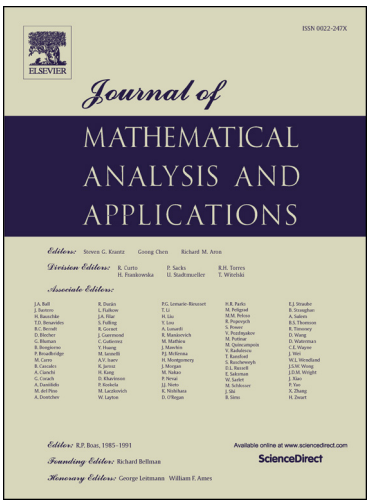

Three systems of orthogonal polynomials and L^2-boundedness of two associated operators

John Musonda, Sten Kaijser

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Three systems of orthogonal polynomials and L^2-boundedness of two associated operators*

John Musonda† Sten Kaijser ‡

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Abstract

In this paper, we describe three systems of orthogonal polynomials belonging to the class of Meixner-Pollaczek polynomials, and establish some useful connections between them in terms of three basic operators that are related to them. Furthermore, we investigate boundedness properties of two other operators, both as convolution operators in the translation invariant case where we use Fourier transforms and for the weights related to the relevant orthogonal polynomials. We consider only the most important but also simplest case of L^2-spaces. However, in subsequent papers, we intend to extend the study to L^p-spaces ($1 < p < \infty$).

2010 MSC: 42C10, 42A50

Keywords: orthonormal basis, Hilbert space, convolution operator.

1 Introduction

In [2, 7], two systems of orthogonal polynomials were presented together with some operators connecting them. One of the systems was the special case of the Meixner-Pollaczek polynomials with parameter $\lambda = 1/2$, a system that can also be described as the orthogonal polynomials obtained from the weight function $\omega_1(x) = 1/(2\cosh\frac{\pi}{2}x)$. The other system was a limiting case of Meixner-Pollaczek polynomials with the parameter λ tending to 0. That system could also be described as the polynomials orthogonal with respect to the Poisson measure for $\{0\}$ in the strip $\mathbb{S} = \{z \in \mathbb{C} : |\mathrm{Im}\, z| < 1\}$. These polynomials were studied in a series of papers by T. K. Araaya [1, 3, 4].

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†Division of Applied Mathematics, Mälardalen University, Box 883, 721 23 Västerås, Sweden (E-mail: john.musonda@mdh.se)

‡Department of Mathematics, Uppsala University, Box 480, 751 06 Uppsala, Sweden (E-mail: sten@math.uu.se)