

ORTHOGONALITY OF POLYNOMIALS INVOLVED IN A LINEAR COMBINATION WITH  
CHEBYSHEV POLYNOMIALS OF THE SECOND KIND

**Mirela Vanina de Mello**

Universidade Estadual de Santa Cruz - UESC, Brazil  
mvmello@uesc.br

Let  $\{U_n\}_{n \geq 0}$  and  $\{S_n\}_{n \geq 0}$  be sequences of polynomials such that

$$U_n(x) = S_n(x) + a_{n-1}S_{n-1}(x),$$

$n \geq 1$ , where  $\{a_n\}_{n \geq 0} \in \mathbb{R}$  and  $U_n$  are the orthogonal Chebyshev polynomials of the second kind. Our interest is to find out when  $\{S_n\}_{n \geq 0}$  is a sequence of orthogonal polynomials.

Marcellán and Petronilho [1] solved this problem by imposing conditions on the coefficients  $a_n$ . They also obtained a relationship between the linear functionals related to the orthogonal polynomials cited. Using results for recovery the orthogonality measure via Turán determinants [2], we determined both: the sequence of coefficients  $a_n$  for which  $\{S_n\}_{n \geq 0}$  is orthogonal, and not only the linear functional, but also the weight function with respect to which the corresponding polynomials  $S_n$  are orthogonal. In other words, the answer to the question posed above was obtained in a completely different and independent way from the approach of Marcellán and Petronilho, with our approach being analytical while the other is entirely algebraic.

Bibliography

- [1] F. Marcellán; J. Petronilho, Orthogonal polynomials and coherent pairs: the classical case, *Indag. Mathem.* 6 (1995), 287-307.
- [2] A. Máté; P. Nevai; V. Totik, Asymptotics for orthogonal polynomials defined by a recurrence relation, *Constr. Approx.* 1 (1985) 231-248.