

APPLIED MATHEMATICS SEMINAR
Department of Mathematics
State University of West Georgia
3:30 PM, WEDNESDAY, NOVEMBER 10, 2004, BOYD 301

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Title: **On weighted (0,2)-type interpolation**

Abstract.

P. Turán initiated the study of (0,2)-interpolation in order to get an approximate solution to the differential equation $y'' + f \cdot y = 0$. A generalization of this problem is the *weighted (0,2) interpolation problem*: Let the system of nodes

$$-\infty \leq a < x_{n,n} < x_{n-1,n} < \dots < x_{1,n} < b \leq \infty$$

be given in the finite (or infinite) open (or closed) interval (a, b) and let $w \in C^2(a, b)$ be a weight function. Find a polynomial R_n of minimal degree satisfying the conditions

$$R_n(x_{k,n}) = y_{k,n}; \quad (wR_n)''(x_{k,n}) = y''_{k,n}, \quad (k = 1, \dots, n; n \in N)$$

where $y_{k,n}, y''_{k,n}$ are arbitrary given real numbers.

In general there does not exist a polynomial of degree $\leq 2n - 1$ satisfying the above requirements, but under additional condition the problem becomes regular.

We study the weighted (0,2)- and (0,1,3)-interpolation problems with and without additional condition. We give a method which helps us to formulate sufficient conditions on the nodal points and the weight function w , for the problem to be regular (to have a unique solution of degree $\leq 2n - 1$). In the regular cases we find simple explicit forms for the fundamental polynomials of interpolation. Examples are given on the zeros of classical orthogonal polynomials.

All faculty and students are welcome.