

ICM-9201-24 Fast Inversion of Vandermonde-Like Matrices Involving Orthogonal Polynomials, D. Calvetti and L. Reichel, BIT, (to appear).

ABSTRACT: Let $\{q_j\}_{j=0}^{n-1}$ be a family of polynomials that satisfy a three-term recurrence relation and let $\{t_k\}_{k=1}^n$ be a set of distinct nodes. Define the Vandermonde-like matrix $W_n = [w_{jk}]_{k,j=1}^n$, $w_{jk} = q_{j-1}(t_k)$. We describe a fast algorithm for computing the elements of the inverse of W_n in $O(n^2)$ arithmetic operations. Our algorithm generalizes a scheme presented by Traub [17] for fast inversion of Vandermonde matrices. Numerical examples show that our scheme often yields higher accuracy than the LINPACK subroutine SGEDI for inverting a general matrix. SGEDI uses Gaussian elimination with partial pivoting and requires $O(n^3)$ arithmetic operations.