1148-15-329 **Mykhailo Kuian*** (michaelkuian@gmail.com), **Lothar Reichel** (reichel@math.kent.edu) and **Sergij Shiyanovskii** (sshiyano@kent.edu). *Optimally Conditioned Rectangular Vandermonde-Like Matrices and their properties.* Preliminary report.

Vandermonde matrices arise frequently in computational mathematics in problems that require polynomial approximation, differentiation, or integration. These matrices are defined by a set of distinct nodes and a monomial basis. A difficulty with Vandermonde matrices is that they typically are quite ill-conditioned when the nodes are real. The ill-conditioning often can be reduced significantly by using a polynomial basis different from the monomials. This was first observed by Gautschi. The matrices so obtained are commonly referred to as Vandermonde-like matrices and have form $V_{n,n} = [p_{i-1}(x_j)]_{i,j=1}^{n}$. Gautschi analyzed optimally conditioned and optimally scaled Vandermonde and Vandermonde-like matrices. We extend Gautschi's analysis of the conditioning of square Vandermonde-like matrices with real nodes to rectangular Vandermonde-like matrices, as well as to Vandermonde matrices with nodes on the unit circle in the complex plane and discuss their applications. Additionally we inverstigate existence and uniquence of perfectly conditioned Vadermonde-like matrices and extend classical Posse theorem. (Received February 05, 2019)