

TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

Wednesday, 17 April 2013, 4:00 p.m.
(tea and social at 3:45)

Matrix Functions: Computation and Applications

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Abstract. For $f : D \subseteq \mathbb{C} \rightarrow \mathbb{C}$ and $A \in \mathbb{C}^{n \times n}$ the matrix function $f(A) \in \mathbb{C}^{n \times n}$ is defined if f is sufficiently smooth on the spectrum of A . This talk will give an overview on where matrix functions such as the matrix exponential, matrix roots or the matrix sign function arise in applications and will then present numerical methods for their efficient and accurate computation.

When A is a large and sparse matrix, $f(A)$ will usually be a dense matrix. In these cases, computing $f(A)$ is prohibitive, but we can approximate $f(A)b$ for some vector b instead or we can compute just a block of $f(A)$. The talk will concentrate on techniques for the large and sparse case. Unlike the linear system case, where the residual $b - Ax$ is a readily available measure for the accuracy of a computed approximation x , the general matrix function case requires novel approaches to assess the accuracy of an iteratively computed approximation, and we will present new developments in this field.