Homework Set #9, Math 451/551

- Problem 26.2 concerns itself with non-normal matrices. If you know what a matrix exponential is, tackle Problem 26.2. Otherwise, do Problem 24.3. If you are doing 26.2 forget about computing the contours and note: the matrix exponential is computed in matlab via the command expm. Type help expm for details.
- 2. Problem 27.1
- 3. Problem 27.3 (optional).
- 4. Implement Algorithm 27.1. Use this power method for estimating the largest eigenvalue and its associated eigenvector, for the matrix $A = QDQ^*$, where

 $D = \text{diag}(\exp(-x))$, x = 0/N, 1/N, ..., (N-1)/N. The matrix Q is obtained in matlab from [Q,R]=qr(U) , where U = randn(N).

This matrix is built with known eigenvalues and eigenfunctions. What are the eigenvalues? (hint: at the matlab prompt, type svd(A)). Try N = 4. Once you are confident that this case works, try a case with N = 128. Compare to the eigenvalues/vectors obtained by using the matlab command

eig(A)

You can get documentation of this matlab command by typing help eig

at the matlab prompt in order to learn how to use this command.