

## HW6

Due 23 May 2006

Q1.

(a) Implement the following simple version of QR iteration with shifts for computing the eigenvalues of a general real matrix  $A$ .

Repeat until convergence:

1.  $\sigma = a_{n,n}$  (use corner entry as shift)
2. Compute QR factorization  $QR = A - \sigma I$
3.  $A = RQ + \sigma I$

You will write your own routine for QR factorization.

(b) What convergence test should you use? Test your program on the matrices in Q3.

Q2.

- (a) Implement power iteration to compute the dominant eigenvalue and a corresponding eigenvector of a general real matrix  $A$ .
- (b) Using any of the methods for deflation given in Section 4.5.4, deflate out the dominant eigenvalue found in part (a) and apply power iteration again to compute the second largest eigenvalue and eigenvector of the same matrix

Q3.

(a) Apply the methods in Q1 and Q2 for the following matrices:

$$A = \begin{bmatrix} 2 & 3 & 2 \\ 10 & 3 & 4 \\ 3 & 6 & 1 \end{bmatrix}, \quad A = \begin{bmatrix} 6 & 2 & 1 \\ 2 & 3 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

And find all eigenvalues by QR factorization as in Q1 and first two eigenvalues and eigenvectors by power iteration. You may use MATLAB routines for finding eigenvalues, to compare the results found in Q1 and Q2.