1. Read Health 4.1, 4.2, 4.5.1–2

2. X-matrix, the sequel

Let $A$ be an $n \times n$ matrix ($n$ must be an EVEN integer), whose entries are all zeros, except for

$$a_{i,i} = i, \quad a_{i,n-i+1} = i/2, \quad i = 1, 2, \ldots, n$$

If you “spy” this matrix in MATLAB, you will see that the structure of this matrix is an “X.” Let $n = 6$, but write all of your code so it could be generalized to any value.

(a) Based on the $\|A\|_1$ and $\|A\|_\infty$ matrix norms, give estimates for what is known about the eigenvalues of this matrix.

(b) Implement the **Power method** to find the largest eigenvalues of $A$, $\lambda_{\text{max}} = \max |\lambda(A)|$. How many iterations does it take to converge to an answer?

(c) Implement the **Inverse Power method** to find the smallest eigenvalues of $A$, $\lambda_{\text{min}} = \max |\lambda(A)|$. How many iterations does it take to converge to an answer?

Turn in print-outs of your code for (b) and (c).

(d) The LAPACK routines for computing eigenvalues and eigenvectors for an $n \times n$ real non-symmetric matrix $A$ are dgeev.c and dgeev.f. These subroutines can be downloaded from [www.netlib.org](http://www.netlib.org). Use the appropriate subroutine to compute the eigenvalues of $A$.

3. Some comic relief: