**2013 Numerical Analysis Final Exam, 100 points**

1. Decompose the following matrix A into L\*U by using Doolittle’s method, . (10)
2. Assume solve the linear system by using: (Iterate at least 3 times, i.e. compute ) (25)
   1. Gauss-Seidel method, (8)
   2. SOR method, w=1.1, (8)
   3. Conjugate gradient method. (9)
3. Compute the major eigenvalue and eigenvector of the matrix A of Problem 2 by using the power method. Assume that the initial guess of the eigenvector is: Please repeat the computation at least 3 times. You must list the eigenvalue and eigenvector computed in each iteration. (15)
4. Compute the eigenvalues and eigenvectors of the matrix A of Problem 2 by using Jacobi method. Please eliminate A[0][1] first. Iterate the computation at most 3 times. (15)
5. Assume Create the Householder matrix to transform  into . (a) write down the vector V. (b) Write down the matrix H. (c) Compute the result of H\*x=? (15)
6. Matrix A of problem 2 is a tri-diagonal matrix. Use the bi-section method to compute one of its eigenvalues. Assume the initial interval is {0, -1}. You must use the recurrence equation to compute the characteristic polynomial. Please iterate the computation at least 3 times. (15)
7. What is the condition number of a matrix? Give an application of condition number in linear system computation. (5)