

Math 2601 C2
Homework 8

Please do all three of the following problems and email me if you need any assistance (mullikin@math.gatech.edu). You are to use some type of mathematics software to perform the following exercises. I recommend Maple since I know how to use it and can answer questions you may have. You may use other packages, such as MatLab or Mathematica, but I will not be able to give you any syntax aid. The problems are to be turned in **Monday March 26, 2001** at 2:05pm. Please, staple your work if it is more than one page (it will be). Please try to format your work so that it is easy to read. Points will be deducted for sloppy work.

Problem 1

Given the system of equations $A\vec{x} = \vec{b}$, where $A = \begin{bmatrix} 4 & 1 \\ 2 & 5 \end{bmatrix}$ and $\vec{b} = \begin{pmatrix} 9 \\ 9 \end{pmatrix}$ perform the following computations.

- i) Find a QR decomposition for A .
- ii) Verify that the Jacobi iteration technique will converge to a solution, and find the approximate solution $\vec{x}^{(15)}$. (Use a computer!!!).

Problem 2

Use the Gauss-Seidel iteration to find the approximation $\vec{x}^{(15)}$ for the system in the previous problem.

Problem 3

Consider the following matrix,

$$\clubsuit = \begin{bmatrix} 27 & 5 & -34 & 53 & -15 \\ -40 & 25 & 40 & 62 & 58 \\ -3 & 1 & 17 & 19 & 4 \\ 1 & 2 & -8 & 31 & 1 \\ 5 & 3 & -12 & 15 & 5 \end{bmatrix}$$

i) Find the largest eigenvalue λ of \clubsuit using the approximation techniques discussed in the web notes.

ii) Approximate the eigenvector \vec{v} associated to the largest eigenvalue using the techniques described in the web notes. You should check to see that this eigenvalue eigenvector pair comes "close" to satisfying the expression $\clubsuit\vec{v} = \lambda\vec{v}$.