

Math 497A Homework I

Due March 24, 2008

1. Show that the computational complexity of Gaussian elimination is on the order of $n^3/3 + O(n^2)$.
2. Apply the Gauss - Seidel Method and solve the linear system,

$$\begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}.$$

3. Prove that Jacobi and Gauss-Seidel methods for system $Ax = b$ with $A = D - L - U$ can be written as

$$x^{k+1} = x^k + B(b - Ax^k)$$

with $B = D^{-1}$ for Jacobi and $(D - L)^{-1}$ for Gauss-Seidel.