

MATH 365 Homework #10

Due: Wednesday, Apr. 25, 2012

Given the following coefficient matrix

$$A = \begin{pmatrix} 4 & 2 & 0 \\ 2 & 10 & 4 \\ 0 & 4 & 5 \end{pmatrix},$$

and the right-hand-side vector

$$b = \begin{pmatrix} 2 \\ 6 \\ 5 \end{pmatrix}.$$

1. (50 points) Based on Gauss-Seidel iterative method, **write and run a real source code on the computer** to solve the linear system $Ax = b$ for x . Please show the number of iteration for a given tolerance ε .

Note: use the Euclidean norm of relative residual, i.e., $\|r^k\|_2 = \frac{\|b - Ax^k\|_2}{\|b - Ax^0\|_2}$, for the stopping criterion: $\|r^k\|_2 \leq \varepsilon$, say, $\varepsilon = 10^{-6}$.

2. (50 points) Given a linear system $Ax = b$ with the following coefficient matrix

$$A = \begin{pmatrix} 16 & 3 \\ 7 & -11 \end{pmatrix},$$

and the right-hand-side vector

$$b = \begin{pmatrix} 11 \\ 13 \end{pmatrix},$$

use your calculator to solve the above linear system for x by means of Gauss-Seidel method, you shall write down at least two iteration steps in terms of Gauss-Seidel scheme.

Note: DO NOT use computer code to solve this problem, please show your detailed process by writing and calculation. However, you can use your Gauss-Seidel computer program done in Question 1 to verify you calculated solution.

Note: In your homework, the right source code and the correct output results must be shown altogether in order to obtain full score.