

ASSIGNMENT 5

Due March 17, 2005 (before start of class)

Problem 6

This problem has multi-parts and subparts.

1. First write a Matlab program to solve numerically the linear system

$$\mathbf{Ax} = \mathbf{b}$$

where

$$\mathbf{A} = \begin{bmatrix} 0.03 & 58.9 \\ 53.1 & -6.10 \end{bmatrix}, \quad \mathbf{b} = \begin{bmatrix} 59.2 \\ 47.0 \end{bmatrix}.$$

You must solve the linear system in three different ways:

- (a) use our function `LU_factor` for LU factorization without pivoting, together with functions `forwardSubstitution` and `backSubstitution`, for forward substitution and backward substitution.
- (b) use the function `lutx.m` for LU factorization with partial row pivoting, together with `forwardSubstitution` and `backSubstitution`.
- (c) use Matlab's backslash operator.

Make sure that your results are displayed with the maximum number of output digits. You may want to use `format long g` or low level C-like formatting such as `sprintf`. Are the results obtained from the 3 different ways exactly the same?

2. Next solve the linear system using LU factorization without pivoting, together with forward substitution and backward substitution as before, except that all arithmetics are to be done "by hand" using three decimal digits of precision and the round-to-even rule. Show all your work with all intermediate results. Compare your results here with those obtained in part 1. Make as much comment as you can.
3. Then solve the linear system using LU factorization with partial row pivoting, together with forward substitution and backward substitution as before in part 1, except that all arithmetics are to be done "by hand" using three decimal digits of precision and the round-to-even rule. Show all your work with all intermediate results. Compare your results here with those obtained in part 1. Make as much comment as you can.