MATHEMATICS 5710, FALL 2001, ASSIGNMENT 2

DUE MONDAY SEPTEMBER 10th

The first four questions here require you to use matlab.

David Eyre's webpage: http://www.math.utah.edu/ eyre/computing/matlab-intro/ gives a helpful introduction to matlab.

Suppose we are given the matrix A and the vector b with elements

$$A = \begin{pmatrix} 4 & 2 & 1 & 0 \\ 2 & 5 & 0 & 1 \\ 1 & 0 & 8 & 2 \\ 0 & 1 & 2 & 6 \end{pmatrix} \qquad b = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$$

1.* Use matlab to find a lower triangular matrix L, and an upper triangular matrix U such that $A = LU$. Verify, using matlab, that A is L times U.

2.* Use matlab to find the inverse matrix A^{-1} and verify using matlab that its product with A is the identity matrix.

3.* Find the vector x which solves the equation $Ax = b$. Verify using matlab that A times x is indeed b.

4.* Now take

$$A = \begin{pmatrix} 2 & 1 & 0 \\ 5 & 0 & 1 \\ 0 & 8 & 2 \\ 1 & 2 & 6 \end{pmatrix} \qquad b = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$$

and use matlab to compute the least squares solution $x = (A^T A)^{-1} A^T b$ to $Ax = b$. Try using matlab to directly solve $Ax = b$ and verify that matlab automatically gives the least squares solution.

5,6,7 and 8 Problems 1.4.1*, 1.4.4, 1.4.10* and 1.4.11 in Strang.

Grading: The first 4 problems are worth one point each. 1.4.1 and 1.4.10 are worth two points each.