

MCS 471 - Extra Credit Problem

Write two Matlab functions. The first should perform Gaussian elimination on the system $Ax = b$. The inputs are the matrix A and the vector b . The outputs should be an upper triangular matrix U and the transformed vector \hat{b} . Your function should only use trivial pivoting. The second function should implement back substitution with inputs an upper triangular matrix U and a vector \hat{b} . The output should be the solution x of $Ux = \hat{b}$.

Use the Matlab diary command to generate a file with your results for the following questions. For each part use your two functions, the Matlab command $A \setminus b$, and $\text{inv}(A) * b$ to compute the solution to $Ax = b$. For each calculation, use the Matlab `ops` command to check the efficiency.

1. Generate a random 7 by 7 matrix for A and a random 7 by 1 vector for b .
2. Use your program on:

$$A = \begin{bmatrix} 3:02 & 1:05 & 2:53 \\ 4:33 & 0:56 & 1:78 \\ 0:83 & 0:54 & 1:47 \end{bmatrix} \quad b = \begin{bmatrix} 1:61 \\ 7:23 \\ 3:38 \end{bmatrix}$$

3. Repeat with a slightly perturbed coefficient

$$A = \begin{bmatrix} 3:02 & 1:05 & 2:54 \\ 4:33 & 0:56 & 1:78 \\ 0:831 & 0:54 & 1:47 \end{bmatrix} \quad b = \begin{bmatrix} 1:61 \\ 7:23 \\ 3:38 \end{bmatrix}$$

You must submit your diary file along with listings of your two functions. You must do the work yourself. If I find papers that are similar then no credit will be given to those papers.