MATH 344 LAB ASSIGNMENT 6 Lab 6

Lab 6 Assignment
Due October 10th on Blackboard by 5 pm.

Follow the instructions. There are many ways to solve a linear system, but for this assignment you should follow the one which is described below. Write a function called **"forward"** to solve $n \times n$ lower triangular systems and a function called **"backward"** to solve $n \times n$ upper triangular systems. Then write a function called **"mySolve"** to solve $n \times n$ systems (under the assumption that the matrix A has an inverse, which means that we have n pivots and so when we divide by the pivot A(i,i) we know it is a nonzero number). You can use the function "LUfact" from lab 5. Test your code on $A\mathbf{x} = \mathbf{b}$ with

$$
A = \begin{pmatrix}
1 & -5 & -4 & -9 & 5 \\
-3 & 0 & 4 & -1 & 0 \\
-8 & -3 & -9 & -3 & -2 \\
8 & -8 & -6 & 9 & 5 \\
4 & 7 & -4 & 0 & -3
\end{pmatrix}, \quad
\mathbf{b} = \begin{pmatrix}
-9 \\
-4 \\
7 \\
6 \\
-2
\end{pmatrix}.
$$

Check to see if your answer is correct.

Note: In this assignment, you will be solving the system $Ax = b$ using the LU factorization. After performing the LU factorization on A, we have
$$LUx = b.$$
Let $\bar{x} = Ux$, then we can solve
$$L\bar{x} = b$$

for $\bar{x}$ using the forward substitution (`forward.m`). Finally, we can solve for the answer x from

$$Ux = \bar{x}$$

using the backward substitution `backward.m`. Solving the inverse of a matrix is difficult especially when the matrix is big. This is why we need different tools to solve for $Ax = b$.

Note: This is a way to solve a square system whose matrix A has an inverse. If you want to solve a general system without these restrictions , then use the "rref" as we did in Lab 4 (don't do it on this assignment).

HW GUIDELINES

- Remember that your assignment should be commented so that a reader would know what the program/function does.

- Remember to suppress output and only show output where appropriate in the file.

- Run all the sections , save your script, export it as a pdf with the appropriate name and submit it on Blackboard. The results of the commands should be part of your pdf.