Submission Procedures: Your homework solution should be submitted both as an attached electronic m-file and hardcopy analysis (problems 1 and 2 only) turned in during 10/8 class. As usual the electronic attachment should be named mce372_5_yourlastname.m and sent to me with the subject line mce372_5. Your single code should solve all problems in order. All figures should have your complete name in the title. All submitted codes for this course should always start with the following first two comment lines:

```matlab
% MCE 372 Homework Assignment #...
% Your Complete Name
```

1. For the given matrices

\[
A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 3 & 1 \\ 2 & 0 & 4 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 4 & 0 \end{bmatrix}, \quad b = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}
\]

compute \( Ab \), \( AB \), \( BA \), \( AB^T \) by hand (show work) and then check with MATLAB. For your MATLAB work, have your code print out results to the command window.

2. For the given matrices, verify the inverse forms by hand (show work) and then check with MATLAB again printing out results to the command window.

\[
C = \begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix}, \quad C^{-1} = \begin{bmatrix} -1 & 1 \\ 2 & -1 \end{bmatrix}, \quad D = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}, \quad D^{-1} = \begin{bmatrix} 0 & 1 & 0 \\ 1 & -1 & 0 \\ -1 & 0 & 1 \end{bmatrix}
\]

3. Using both the inverse and Gauss MATLAB function programs, solve the system of equations given by

Last Name A - M: \( Ax = b \)

Last Name N - Z: \( Bx = b \)

where the matrices \( A, B, b \) are those given in Problem 1 of this set. Follow the “function call” scheme discussed in class using the function programs InverseF.m and GaussF.m that can be downloaded from the course web site. You only need to submit your MATLAB code that calls the two function programs; i.e. no need to submit InverseF.m and GaussF.m Have your code print out results to the command window.

4. Using some of the MATLAB code from LLS.m on the course web site, construct a code that will run random systems of equations with increasing sizes and make a comparison plot of the amount of run time as a function of size. Your code should: run sizes in the range 50-500 equations in increments of 50; keep track of the execution times using tic, x=toc commands; and finally plot the results for different solution methods. In specific compare the following pairs of cases:
Typical graphs would look like the ones shown below, but keep in mind that with randomly generated equations the results will vary somewhat. Also label your plots like those shown.

Last Name A-M: Compare MATLAB Inverse Method with Cramer’s Rule

Last Name N-Z: Compare MATLAB Gauss Elimination Method with Cramer’s Rule