Name: _____

Date: _____

Collaborators: _____

(Collaborators submit their individually written assignments together)

Question:	1	2	3	Total
Points:	40	10	10	60
Score:				

Instructor/grader comments:

LU factorization

1. Alice buys three apples, a dozen bananas, and one cantaloupe for $2.36. Bob buys a dozen apples and two cantaloupes for $5.26. Carol buys two bananas and three cantaloupes for $2.77.

   (a) (5 points) In matrix notation the system of three linear equations with three unknowns that describe the problem can be written as $Ax = b$, In the space below write down A and b:

   (b) (5 points) Write matlab function (call it **hw04p1abc()**) that accepts no parameters and returns the matrix A and the column vector b that you found in Step (a). Provide help text that matlab will print if the command `help hw04p1abc` is typed.

   (c) (15 points) Use gaussian elimination without pivoting to reduce the matrix A to the upper triangular form. Present your calculations, step by step, in the space below. Clearly indicate multiplication factors that you use.

(d) (5 points) Using the results of your gaussian elimination process write the lower triangular matrix L and the upper triangular matrix U such that $A = L \cdot U$.

(e) (5 points) Use L and U to calculate the determinant of matrix A. Write you calculations below:

(f) (5 points) Write a matlab script (call it `hw04p1.m`) that prints the help for your function `hw04p1abc()`, calls your function to initialize A, initializes the matrices L and U, verifies the relation $A = L \cdot U$, and calculates `det(A)` using matlab own function.

Complexity

2. (10 points) How many floating point operations (additions, multiplications, etc.) it takes to multiply a column vector of size n by an $n \times n$ matrix? It takes about 10^{-2} seconds (on a slow computer) to multiply a matrix and a vector of size 10^4. **Estimate** how long it takes to multiply a matrix and a vector of size 10^6. Present your answer and explain your reasoning in the gitlab's README.md file.

Gitlab

3. (10 points) Create a gitlab project called **hw04** (name it exactly as shown). Upload **all** matlab files that are required to run your code. Share the project with the instructor and the TA and grant them **Reporter** privileges.