
Name (Print) _____

Instructions:

1. The first line of your program should contain your first and last name.
2. You are required to type the honor code "On my honor as a student, I have neither given or received aid on this exam" and type your name at the beginning of the MSWord or PDF file of your solution.
3. The output of the problems should be given in a MSWord or a PDF file. The plot of Problems 2 should also be given in the same MSWord or PDF file.
4. Upload FOUR m-files (each problem has a main program and a function program) and ONE MSWord or a PDF file

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Problem 1

Solve the following system of equations using **Gauss-Elimination**

$$\begin{cases} 8x_1 - 3x_2 - x_3 + 17x_4 = 67 \\ -2x_1 + 2x_2 - 4x_3 + 3x_4 = 2 \\ -x_1 - 3x_2 + 7x_3 + x_4 = 18 \\ 11x_1 - 7x_2 - 2x_3 + 2x_4 = -1 \end{cases}$$

Requirements:

a. You will have one main program and one function program.
b. Main program
   a. Define the augmented matrix [C] by typing in the values of coefficients and constants
   b. determine number of rows and columns of [C]
   c. call your gauss elimination function program
   d. output results. The output should be given in the following form

```
**********************
  x(1) = #.###
  x(2) = #.###
  x(3) = #.###
  x(4) = #.###
**********************
```

c. Gauss-elimination function program
   a. Use forward elimination to zero out the elements below the diagonal
      - **After you zero out one column, output the matrix using function 'disp' in the function program. We will output 4 matrices in total. Store all the matrices in the MSWord or PDF file**
   b. Use back substitution to calculate the values of x_i

Problem 2

Given the following set of data points

t	0	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35
x	1.48	1.26	1.01	0.85	0.89	1.10	1.35	1.54	1.64	1.62

Find **the General Linear Least Squares solution** to the equation below, that is, find the 'best' coefficients a_1, a_2, and a_3, where ω_0= 4.19.

$$x^2 = a_1 cos(\omega_0 t) + a_2 sin(\omega_0 t) + a_3$$

(Please be noted that the left side is x^2)

Requirements:

1. You will have one main program and one function program.
2. Main Program
    a. Define constant ω_0, and define vector *t* and *x*. To use the General linear least squares regression, you need to define a new vector for x^2
    b. Call function program GLLS. Pass the vectors and constant to the function.
    c. outputs will be the vector **{*a*}** containing a_1, a_2 and a_3. the output should look **very** similar to the following:

```
The calculated coefficients using Least Squares are:
   a1 = #.###
   a2 = #.###
   a3 = #.###
```

    d. generate a plot (x vs. t) showing the raw data points and a smooth curve generated by the equation for *x* using 25 points for *t* between 0 and 1.4
3. Function Program
    a. inputs will be the vectors and ω_0
    b. create matrix [Z]
    c. calculate vector {a}