# Linear Algebra Fall 2022– Course Project “Cramer’s Rule”

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## Instructions

Write a programming code using MATLAB, Python, C++ or any programming language to solve a system of $n$ linear equations in n variables using Cramer’s Rule.

- Your code should allow the user to choose the size $n \times n$ of the system.
- Make sure that your program first checks that the coefficient matrix is invertible.
- The output of your program must be the unique solution of the system.
- Use your code to solve exercises 25, 26 of Section 3.4, page 142.
- Save your code together with the inputs and outputs of exercise 25 or 26 of section 3.4 as a second PDF file, then submit it to its assigned slot on Gradescope.

## Exercise 25

Solve the following system of linear equation using Cramer’s Rule:

> 3x_1 – 2x_2 + 9x_3 + 4x_4 = 35
>
> –x_1 – 9x_3 – 6x_4 =–17
>
> 3x_3 + x_4 = 5
>
> 2x_1 + 2x_2 + 8x4 = –4

### Solution

```
Enter the number of rows and columns: 4
Enter the elements of matrix:
Enter the elements of row 1
3
-2
9
4
Enter the elements of row 2
-1
0
-9
-6
Enter the elements of row 3
0
0
3
1
Enter the elements of row 4
```

```
2
2
0
8
The determinant of the coefficient matrix is:  36
The coefficient matrix is non-singular.
Enter the elements of solution matrix:
35
-17
5
-4
The solution matrix is:  [35, -17, 5, -4]
The value of x 1 is:  5.0
The value of x 2 is:  -3.0
The value of x 3 is:  2.0
The value of x 4 is:  -1.0

Process finished with exit code 0
```

## Exercise 26

Solve the following system of linear equation using Cramer's Rule:

> $-x_1 - x_2 + x_4 = -8$
>
> $3x_1 + 5x_2 + 5x_3 = 24$
>
> $2x_3 + x_4 = -6$
>
> $-2x_1 - 3x_2 - 3x_3 = -15$

### Solution

```
Enter the number of rows and columns: 4
Enter the elements of matrix:
Enter the elements of row 1
-1
-1
0
1
Enter the elements of row 2
3
5
5
0
Enter the elements of row 3
0
0
2
1
Enter the elements of row 4
-2
```

```
-3
-3
0
The determinant of the coefficient matrix is:  1
The coefficient matrix is non-singular.
Enter the elements of solution matrix:
-8
24
-6
-15
The solution matrix is:  [-8, 24, -6, -15]
The value of x 1 is:  3.0
The value of x 2 is:  7.0
The value of x 3 is:  -4.0
The value of x 4 is:  2.0

Process finished with exit code 0
```