

Centre for Foundation Studies in Science, University of Malaya
Semester 2 Session 2021/2022
FAC1003 Programming 2: Tutorial 13

Answer ALL the questions.

1. Construct a full C code to find the inverse of $\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$. Given below is the algorithm.

Your program must demonstrate the following algorithm in the output.

Example: User input for a11, a12, a21, a22. [array]

$$\begin{bmatrix} 7 & -6 \\ -2 & 2 \end{bmatrix}$$

- [1] Interchange leading diagonal elements: $\begin{bmatrix} 2 & -6 \\ -2 & 7 \end{bmatrix}$

- [2] Change signs of the other 2 elements: $\begin{bmatrix} 2 & 6 \\ 2 & 7 \end{bmatrix}$

- [3] Find $|A|$

Remember that our original matrix (from the question) is $A = \begin{bmatrix} 7 & -6 \\ -2 & 2 \end{bmatrix}$.

So the determinant of A is given by:

$$|A| = \begin{vmatrix} 7 & -6 \\ -2 & 2 \end{vmatrix} = 14 - 12 = 2$$

If $|A| = 0$ then such a matrix is called "Singular".

- [4] Multiply [2] with $\frac{1}{|A|}$

$$A^{-1} = \frac{1}{|A|} \begin{bmatrix} 2 & 6 \\ 2 & 7 \end{bmatrix} = \frac{1}{2} \begin{bmatrix} 2 & 6 \\ 2 & 7 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 1 & 3.5 \end{bmatrix}$$

Is it correct?

Check: $A^{-1} A = I$.

Centre for Foundation Studies in Science, University of Malaya
Semester 2 Session 2021/2022
FAC1003 Programming 2: Tutorial 13

2. Write a program in C for multiplication of two Matrices (3 x 3).

Expected Output:

Input elements in the first matrix:

element - [0],[0] : 1

element - [0],[1] : 2

element - [0],[2] : 3

element - [1],[0] : 0

element - [1],[1] : 1

element - [1],[2] : 0

element - [2],[0] : -1

element - [2],[1] : -5

element - [2],[2] : 6

Input elements in the second matrix:

element - [0],[0] : 4

element - [0],[1] : 5

element - [0],[2] : 6

element - [1],[0] : 7

element - [1],[1] : 8

element - [1],[2] : 9

element - [2],[0] : 10

element - [2],[1] : -4

element - [2],[2] : -2

The First matrix is :

1 2 3

0 1 0

-1 -5 6

The Second matrix is :

4 5 6

7 8 9

10 -4 -2

The multiplication of two matrix is :

????

Centre for Foundation Studies in Science, University of Malaya
Semester 2 Session 2021/2022
FAC1003 Programming 2: Tutorial 13

3. Write an interactive C program to process the exam scores for a group of students in Physical Sciences. The number of subjects taken by the students are all equal in the class. Enter the number of students, the student's no ID and their exam scores. Calculate an average score for each student. Store the student No ID in a two-dimensional character array and store the exam and the average scores in a two-dimensional floating-point array. Label the output clearly. You can refer to the sample output below.

```

enter the number of students
3
StudID[0]
00125
StudID[1]
00126
StudID[2]
00127
*****
00125
Maths enter for a[0][0]==>56
Chemistry enter for a[0][1]==>89
Physics enter for a[0][2]==>63
Programming enter for a[0][3]==>78
00126
Maths enter for a[1][0]==>23
Chemistry enter for a[1][1]==>69
Physics enter for a[1][2]==>71
Programming enter for a[1][3]==>78
00127
Maths enter for a[2][0]==>82
Chemistry enter for a[2][1]==>56
Physics enter for a[2][2]==>93
Programming enter for a[2][3]==>78
Stud*****Maths*****Chemistry*****Physics*****Programming*****Average*****
00125      56.00|      89.00|      63.00|      78.00|      71.50
00126      23.00|      69.00|      71.00|      78.00|      60.25
00127      82.00|      56.00|      93.00|      78.00|      77.25

```