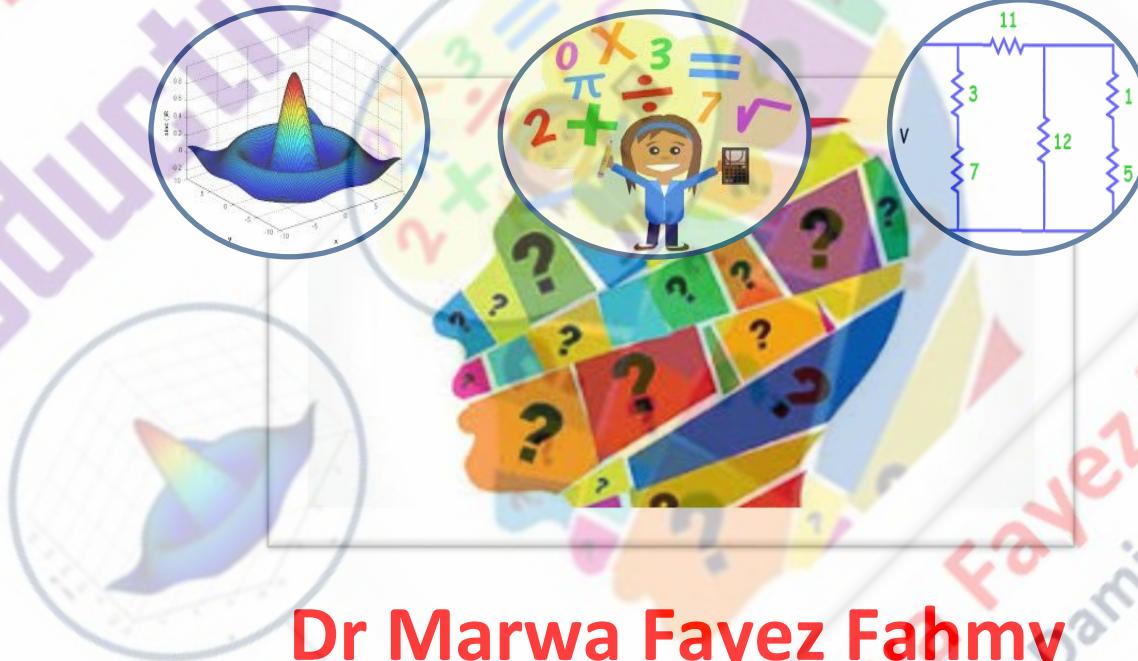


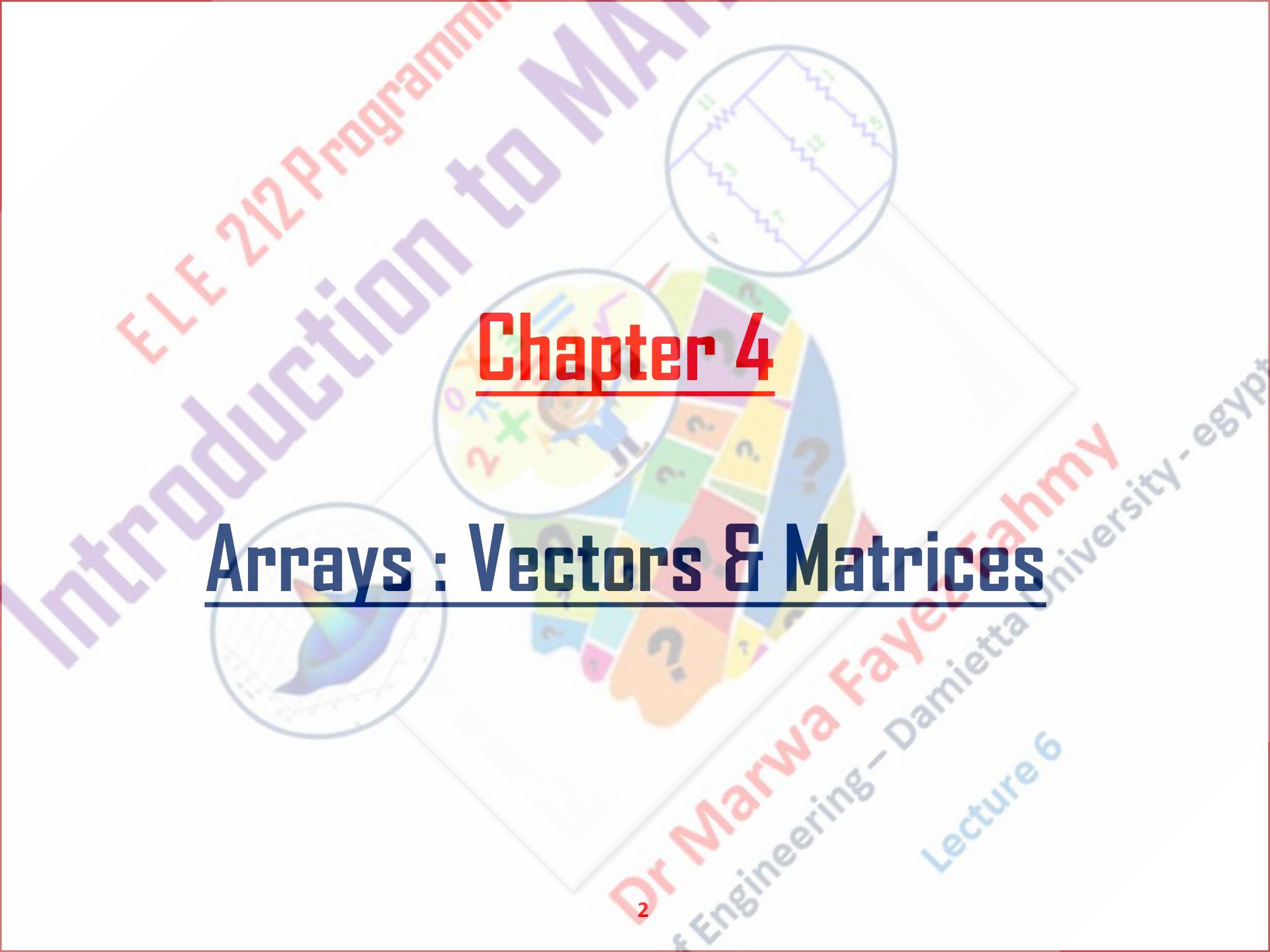
ELE 212 Programming

Introduction to MATLAB



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Chapter 4

Arrays : Vectors & Matrices

Notes:

اكبر بعـ Length

منها بنحصل على عدد الصفوف وعدد الأعمدة Size

$$A = [2 \ 3; 4 \ 5; 6 \ 7]$$

$$B = \text{size}(A) \rightarrow B = 3 \ 2$$

$$R = \text{size}(A, 1) \rightarrow R = 3$$

$$C = \text{size}(A, 2) \rightarrow C = 2$$

ضرب عناصر كل عمود

ضرب عناصر كل صف

ضرب كل العناصر

Notes:

$A = [2 \ 3 \ 5 ; 7 \ 2 \ 6; 9 \ 1 \ 10]$

القيمة العظمى فى كل عمود \rightarrow

القيمة العظمى فى كل صف \rightarrow

القيمة العظمى فى المصفوفة كاملة \rightarrow

$B = 5;$

$C = \max(A, B) \rightarrow$

يقارن المصفوفة **بالقيمة القياسية** ويضع فى المصفوفة القيمة الاكبر

$[m,j] = \max(a)$

$m =$

9 3 10

$j =$

3 1 3

$[m,j] = \max(a, [], 2^m) =$

$j =$
3 1 3

5 7 10

Notes:

$A = [2 \ 3 \ 5 ; 7 \ 2 \ 6; 9 \ 1 \ 10]$

$M1 = \min(A) \rightarrow$ القيمة الصغرى في كل عمود

$M2 = \min(A,[],2) \rightarrow$ القيمة الصغرى في كل صف

$M3 = \min(A(:)) \rightarrow$ القيمة الصغرى في المصفوفة كاملة

$B = 5;$

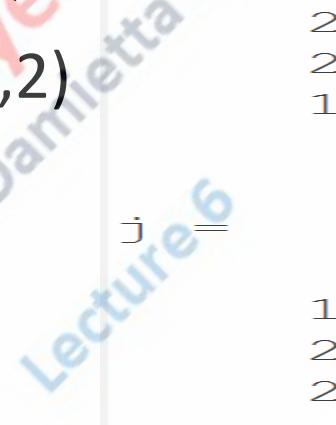
$C = \min(A, B) \rightarrow$

يقارن المصفوفة **بالقيمة القياسية** ويضع في المصفوفة القيمة الصغرى

$[m,j] = \min(a)$



$[m,j] = \min(a,[],2)$



Notes:

$A = [2 \ 3 \ 5 ; 7 \ 2 \ 6; 9 \ 1 \ 10]$



2	3	5
7	2	6
9	1	10

$S1 = \text{sum}(A)$ → (صف) مجموع عناصر كل عمود

$S2 = \text{sum}(A, 2)$ → (عمود) مجموع عناصر كل صف

$S3 = \text{sum}(\text{sum}(A), 2)$ → 45 مجموع كل العناصر

$S4 = \text{sum}(A(:))$ → مجموع كل العناصر

$\text{numel} == \text{prod}(\text{size}(A))$

Notes:

$A=[2\ 3\ 5\ ;\ 7\ 2\ 6\ ;\ 9\ 1\ 10]$

$A1=sort(A)$ → يرتّب كل عمود تصاعدي

$A2=sort(A,2)$ → يرتّب كل صف تصاعدي

$A3=sortA(:))$ → يرتّب عناصرها لها عمود واحد

$D1=sort(A,'descend')$ → يرتّب كل عمود تناظري

$D2=sort(A,2,'descend')$ → يرتّب كل صف تناظري

$D3=sort(A(:), 'descend'))$ → يرتّب عناصرها كعمود واحد تناظري

Magic(3)

8	1	6
3	5	7
4	9	2

السؤال الأول

Create the row vector of odd numbers from 1 to 21,

$$L = 1 \ 3 \ 5 \ 7 \ 9 \ 11 \ 13 \ 15 \ 17 \ 19 \ 21$$

Find the sum S of vector L's elements.



Command Window

```
>> L=(1:2:21)
L =
    1     3     5     7     9    11    13    15    17    19    21
>> sum(L)
ans =
    121
```

السؤال الثاني

a. Form the matrix

$$A = \begin{matrix} 2 & 3 & 2 \\ 1 & 0 & 1 \end{matrix}$$

b. Find $A(2,2)$

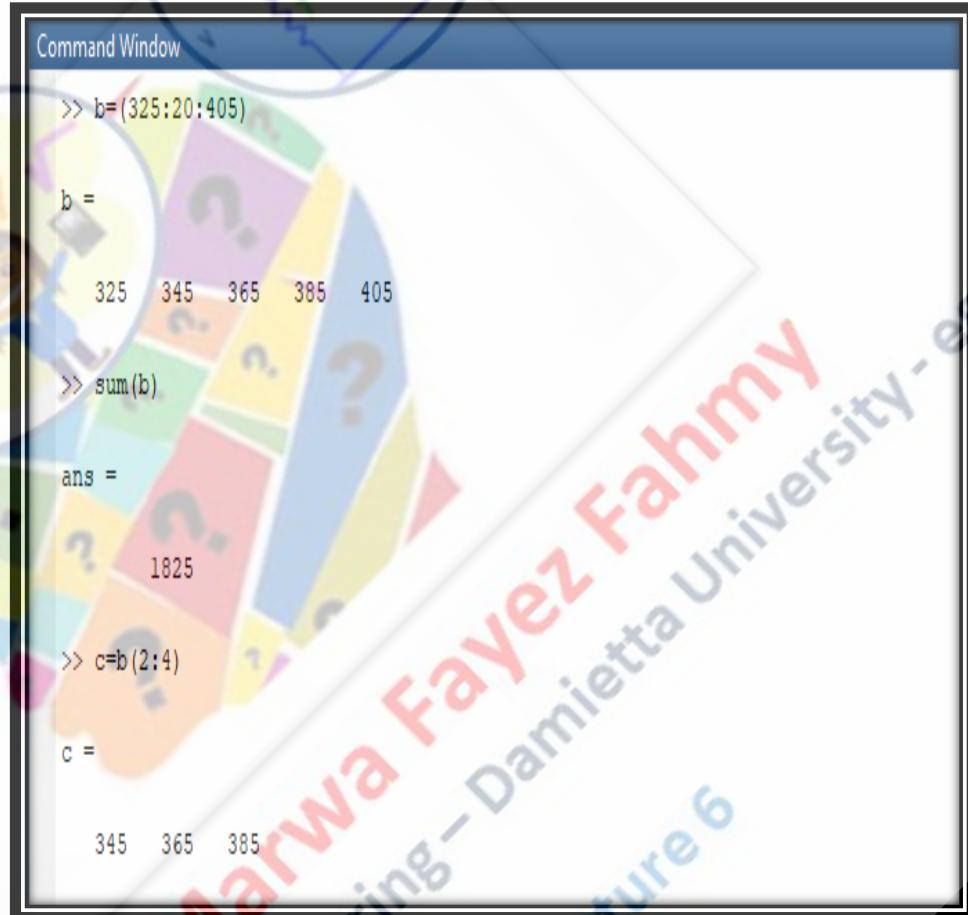
The image shows a MATLAB Command Window with a decorative background featuring a cartoon character and question marks. The window displays the following code and output:

```
Command Window
>> A=[2 3 2;1 0 1]
A =
    2     3     2
    1     0     1
>> A(2,2)
ans =
    0
```

السؤال الثالث

A row vector b from 325 to 405 with an interval of 20. Do the following:

- Create the vector
- sum a of vector C's elements.
- Extract elements from 2 to 4



The image shows a MATLAB Command Window with the following text:

```
Command Window
>> b=(325:20:405)
b =
    325    345    365    385    405
>> sum(b)
ans =
    1825
>> c=b(2:4)
c =
    345    365    385
```

السؤال الرابع

Create the following matrix

1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8

and find :

- Find elements equal 5
- Find elements greater than 5
- $a(1,4)$

The image shows a MATLAB Command Window with a decorative background featuring a cartoon character and mathematical symbols. The window displays the following code and output:

```
Command Window
>> a=[1 2 3 4 5;2 3 4 5 6;3 4 5 6 7;4 5 6 7 8]
a =
    1     2     3     4     5
    2     3     4     5     6
    3     4     5     6     7
    4     5     6     7     8
```

`find(A==5)`

`find(A>5)`

السؤال الخامس

Create two different vectors of the same length and add them.

- b) Now subtract them.
- c) Perform element-by-element multiplication on them.
- d) Perform element-by-element division on them.
- e) Raise one of the vectors to the second power.



The image shows a MATLAB Command Window with the following code and output:

```
Command Window
>> x=linspace(1,15,7)
x =
    1.0000    3.3333    5.6667    8.0000   10.3333   12.6667   15.0000
>> y=linspace(5,20,7)
y =
    5.0000    7.5000   10.0000   12.5000   15.0000   17.5000   20.0000
>> z=x+y
z =
    6.0000   10.8333   15.6667   20.5000   25.3333   30.1667   35.0000
>> w=x-y
w =
   -4.0000   -4.1667   -4.3333   -4.5000   -4.6667   -4.8333   -5.0000
>> a=x.*y
a =
    5.0000   25.0000   56.6667  100.0000  155.0000  221.6667  300.0000
```

السؤال الخامس



Command Window

```
>> b=x./y
```

b =

0.2000	0.4444	0.5667	0.6400	0.6889	0.7238	0.7500
--------	--------	--------	--------	--------	--------	--------

السؤال السادس

Create a 3×3 matrix and display the first row and the second column on the screen.

```
Command Window
>> A=randi(3,3)

A =
    3     1     3
    1     2     3
    3     2     1

>> A(1, :)

ans =
    3     1     3

>> A(:, 2)

ans =
    1
    2
    2
```

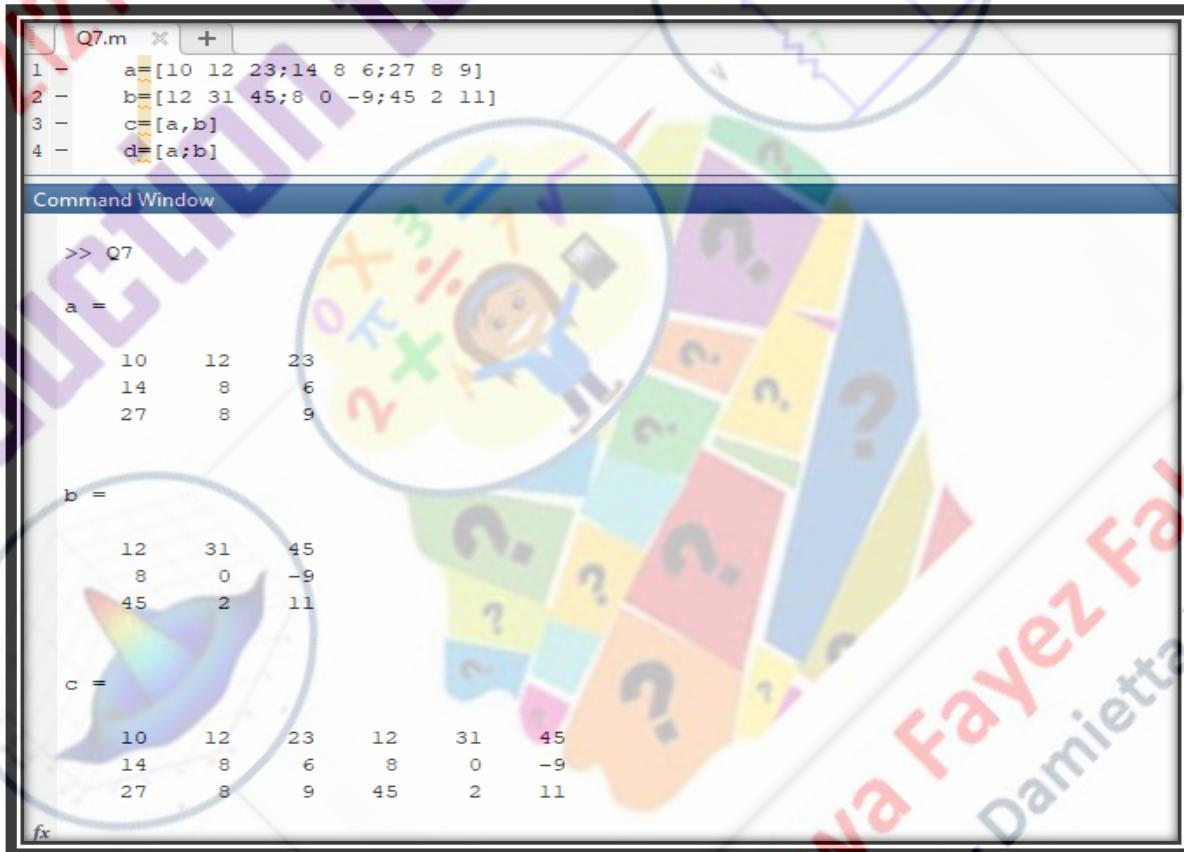
السؤال السابع

Write matlab code do the following :

- Create matrix $a = \begin{matrix} 10 & 12 & 23 \\ 14 & 8 & 6 \\ 27 & 8 & 9 \end{matrix}$ & $b = \begin{matrix} 12 & 31 & 45 \\ 8 & 0 & -9 \\ 45 & 2 & 11 \end{matrix}$
- $c = \text{concatenate two matrices horizontally}$
- $d = \text{concatenate two matrices vertically}$
- Find $\text{diag}(a,2)$
- Find $\text{diag}(b,3)$

} Quiz

السؤال السابع



The image shows a MATLAB Command Window titled "Q7.m". The code entered is:

```
1 - a=[10 12 23;14 8 6;27 8 9]
2 - b=[12 31 45;8 0 -9;45 2 11]
3 - c=[a,b]
4 - d=[a;b]
```

The output in the Command Window is:

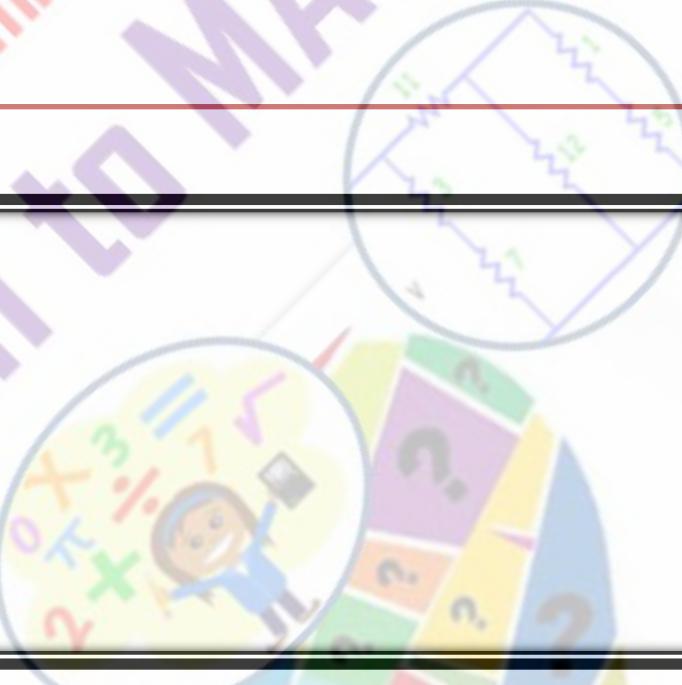
```
>> Q7
a =
    10    12    23
    14     8     6
    27     8     9

b =
    12    31    45
     8     0   -9
    45     2   11

c =
    10    12    23    12    31    45
    14     8     6     8     0   -9
    27     8     9    45     2   11
```

السؤال السابع

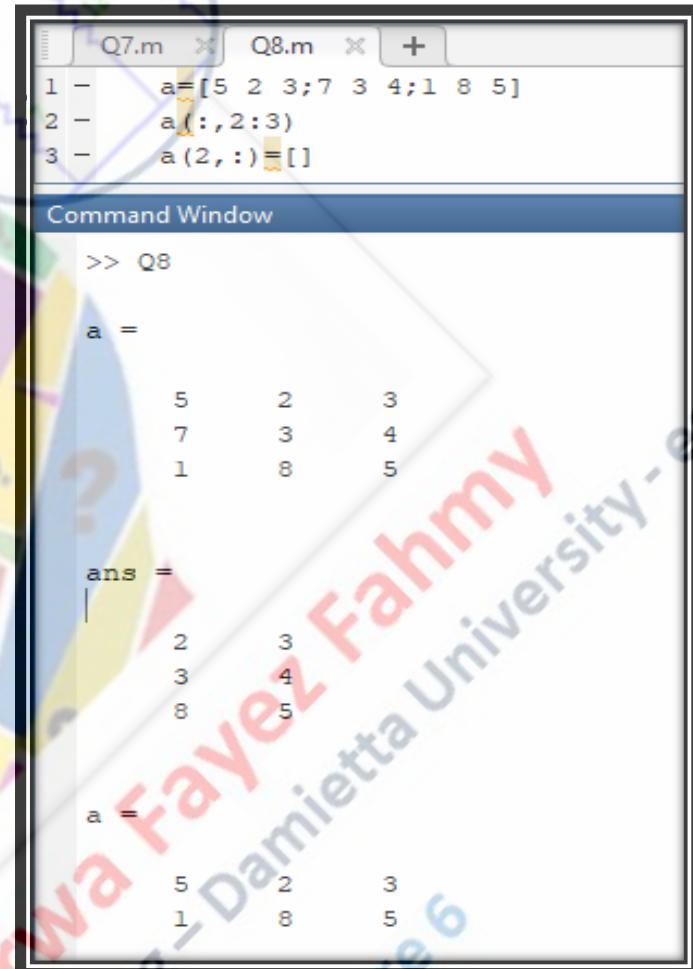
```
d =  
10 12 23  
14 8 6  
27 8 9  
12 31 45  
8 0 -9  
45 2 11  
>> |
```



السؤال الثامن

Write matlab code do the following

- Create matrix $a = \begin{matrix} 5 & 2 & 3 \\ 7 & 3 & 4 \\ 1 & 8 & 5 \end{matrix}$
- Print all elements from column 2 to 3
- delete the second row of matrix a



The image shows a MATLAB interface with two open files: Q7.m and Q8.m. The Q7.m file contains the code to create matrix a. The Q8.m file contains the code to print columns 2 to 3 and delete the second row. The Command Window shows the execution of Q8.m and the resulting matrices.

```
Q7.m
1 - a=[5 2 3;7 3 4;1 8 5]
2 - a(:,2:3)
3 - a(2,:)=[]

Command Window
>> Q8
a =
    5     2     3
    7     3     4
    1     8     5

ans =
    2     3
    3     4
    8     5

a =
    5     2     3
    1     8     5
```

السؤال التاسع

Write matlab code do the following :

- Create matrix $a = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 1 & 2 & 5 \end{bmatrix}$ & $b = \begin{bmatrix} 2 & 1 & 3 \\ 5 & 0 & -2 \\ 2 & 3 & -1 \end{bmatrix}$
- Print the prod is the multiplication of two matrices



```
Q8.m x Q9.m x +
1 - a=[1 2 3;2 3 4;1 2 5]
2 - b=[2 1 3;5 0 -2;2 3 -1]
3 - prod=a*b
4

Command Window
>> Q9
a =
1 2 3
2 3 4
1 2 5

b =
2 1 3
5 0 -2
2 3 -1

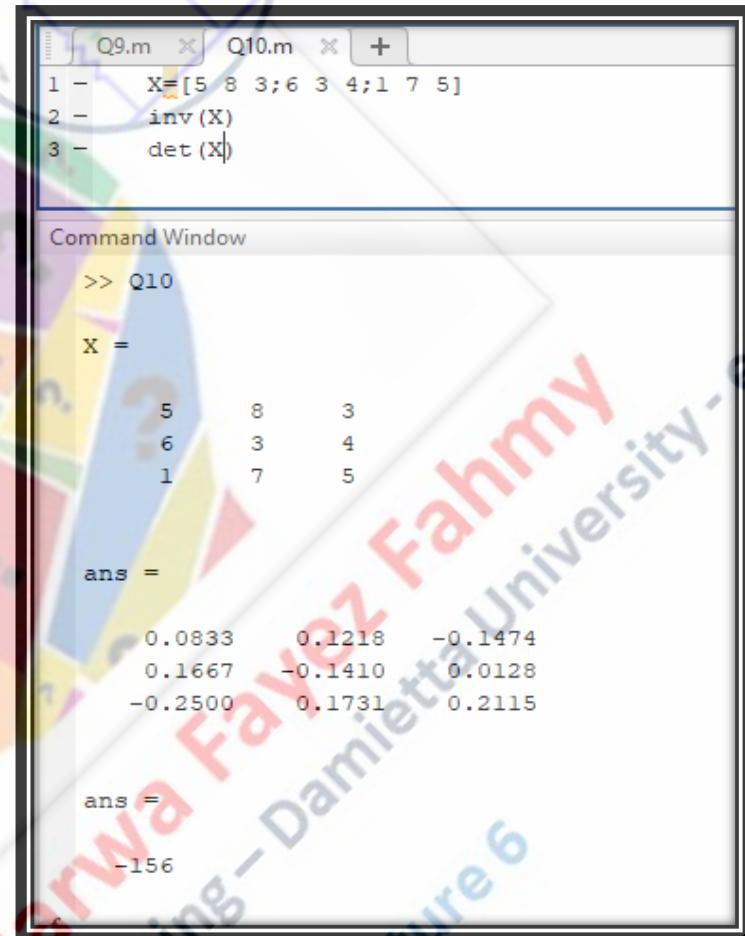
prod =
18 10 -4
27 14 -4
22 16 -6

fx >>
```

السؤال العاشر

Write matlab code do the following :

- Create matrix $a = \begin{matrix} 5 & 8 & 3 \\ 6 & 3 & 4 \\ 1 & 7 & 5 \end{matrix}$
- Print the inverse of the matrix
- Print the determine of the matrix



The image shows a MATLAB interface with two open files: Q9.m and Q10.m. The Q10.m file contains the following code:

```
Q9.m          Q10.m x + |  
1 - X=[5 8 3;6 3 4;1 7 5]  
2 - inv(X)  
3 - det(X)
```

The Command Window displays the results of running Q10.m:

```
>> Q10  
  
X =  
  
5 8 3  
6 3 4  
1 7 5  
  
ans =  
  
0.0833 0.1218 -0.1474  
0.1667 -0.1410 0.0128  
-0.2500 0.1731 0.2115  
  
ans =  
  
-156
```

السؤال الحادي عشر

Write matlab code to do the following :

- Create a 6×3 matrix A of zeros
- Create a matrix a B of ones with 2 rows and 4 columns.



The image shows a MATLAB Command Window with the following content:

```
Command Window
>> ones(2,4)
ans =
    1   1   1   1
    1   1   1   1
>> size(ans)
ans =
    2   4
```

The window has a decorative background featuring a cartoon character and mathematical symbols like pi, x, and question marks.

