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MIT-WPU

S. Y. B. Tech. (Electrical and Computer Engineering)

Semester: IV **Subject: Electrical Circuit Analysis**

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Roll No: 33 → PRN-1032211745 **Batch:** A2

Experiment No: 01

Name of the Experiment: Different operations on matrices using MATLAB

Performed on: 16/8/2022

Submitted on: 6/9/2022

Marks	Teacher's Signature with Date
19/20	6-9-22

Aim: Performing various operations on matrices using MATLAB

Prerequisite: Knowledge of matrices.

Theory:

MATLAB is an abbreviation for "matrix laboratory." While other programming languages mostly work with numbers one at a time, MATLAB is designed to operate primarily on whole matrices and arrays. All MATLAB variables are multidimensional arrays, no matter what type of data.

To create an array with four elements in a single row, separate the elements with either a comma (,) or a space. To create a matrix that has multiple rows, separate the rows with semicolons.
For example, a = [1 3 5; 2 4 6; 7 8 10]
a = *3×3*

```
1   3   5
2   4   6
7   8   10
```

MATLAB allows you to process all of the values in a matrix using a single arithmetic operator or function.
Some matrix building functions are listed below.

1. eye - identity matrix
2. zeros - matrix of zeros
3. ones - matrix of ones
4. diag - extract diagonal of a matrix or create diagonal matrices
5. triu - upper triangular part of a matrix

6. tril - lower triangular part of a matrix
7. rand – ran

Commands in the second sub-category of matrix functions are 1. size- size of a matrix

1. det -determinant of a square matrix
2. inv- inverse of a matrix
3. rank- rank of a matrix
4. rref- reduced row echelon form
5. eig- eigenvalues and eigenvectors
6. poly- characteristic polynomial generated matrix

Activity:

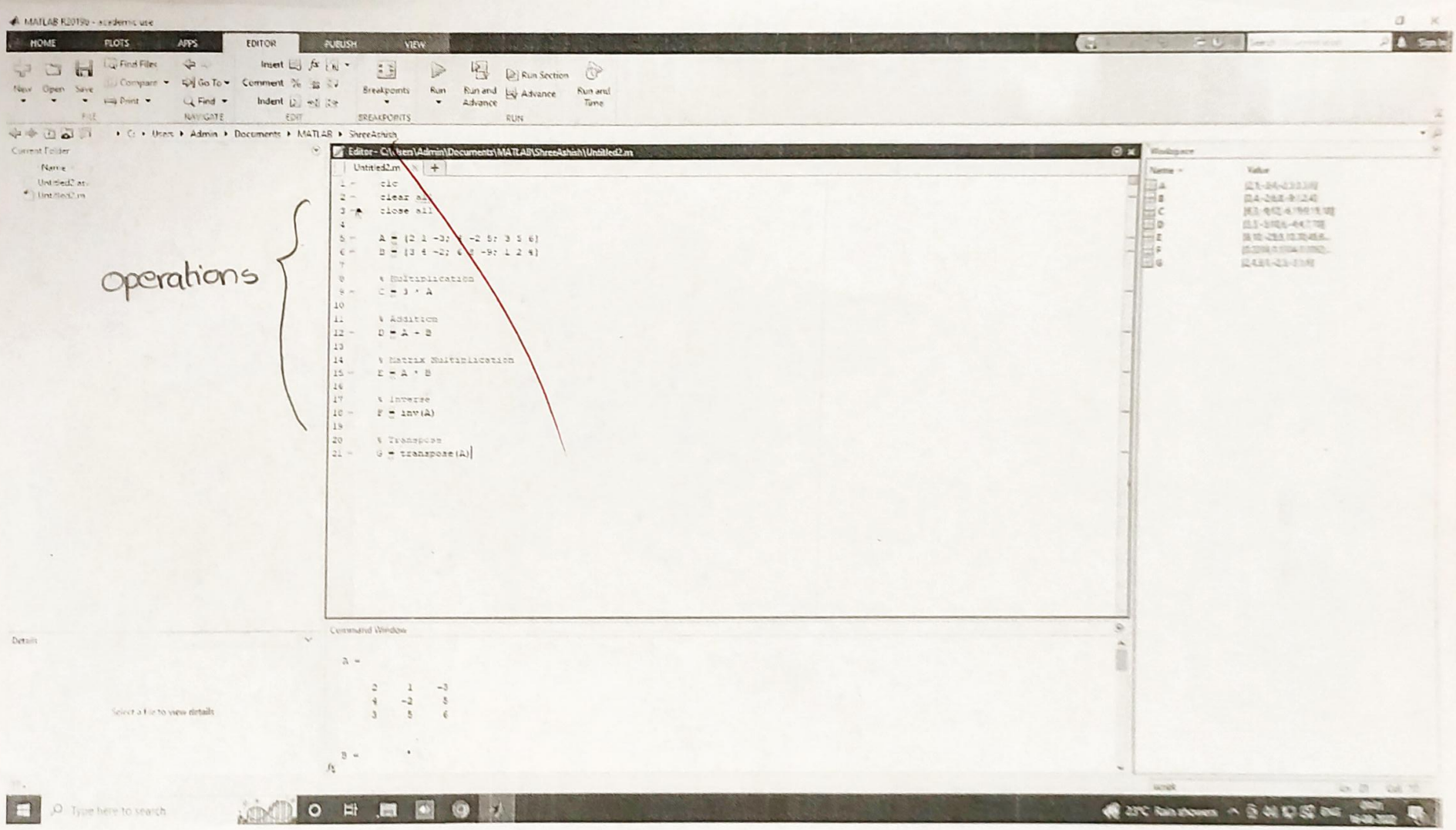
Create two 3 x 3 matrices A and B.
Perform following operations.

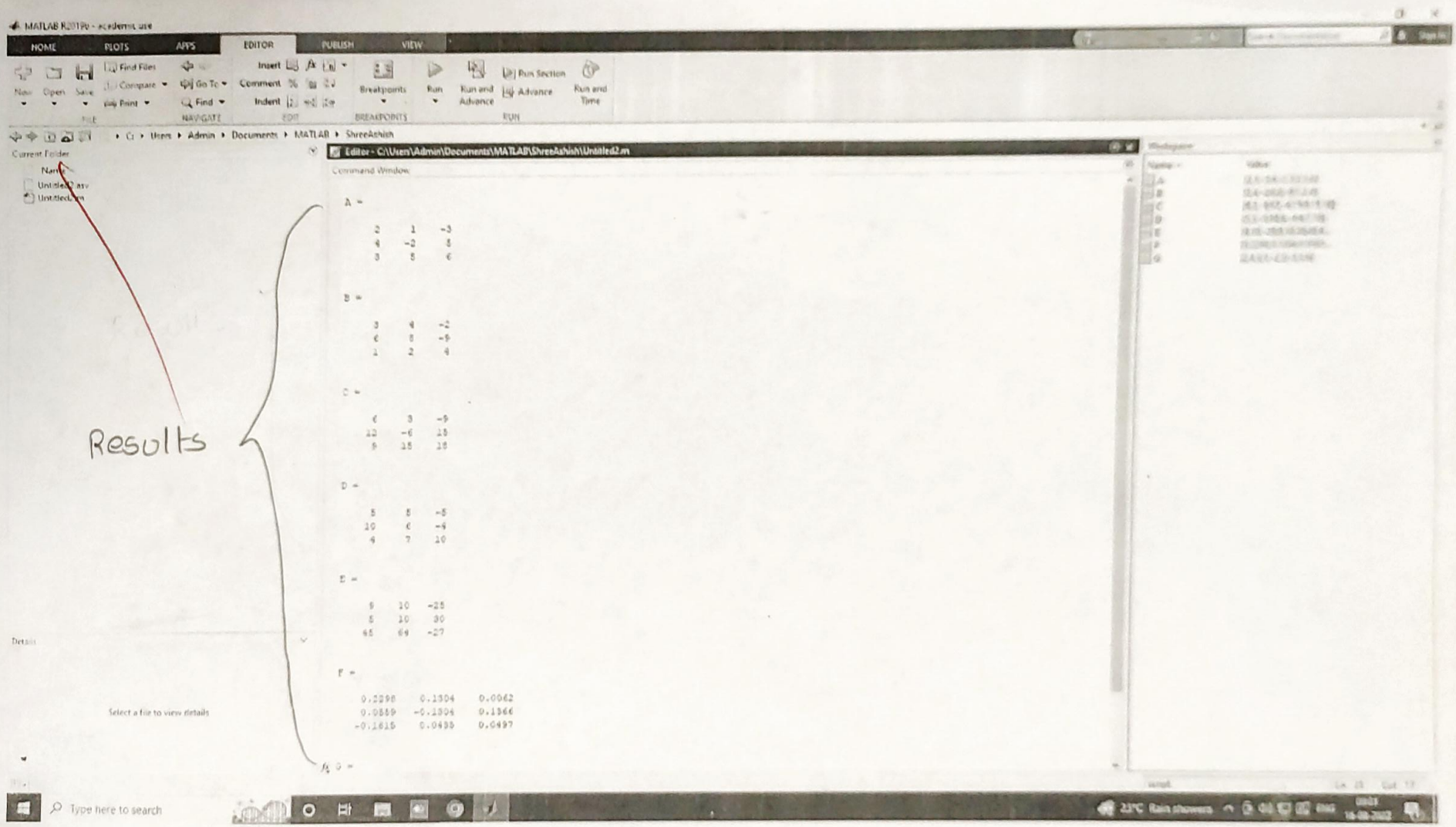
1. C = A + B
2. D = 3 * A
3. E = A * B
4. Transpose of A
5. F = Inverse of A

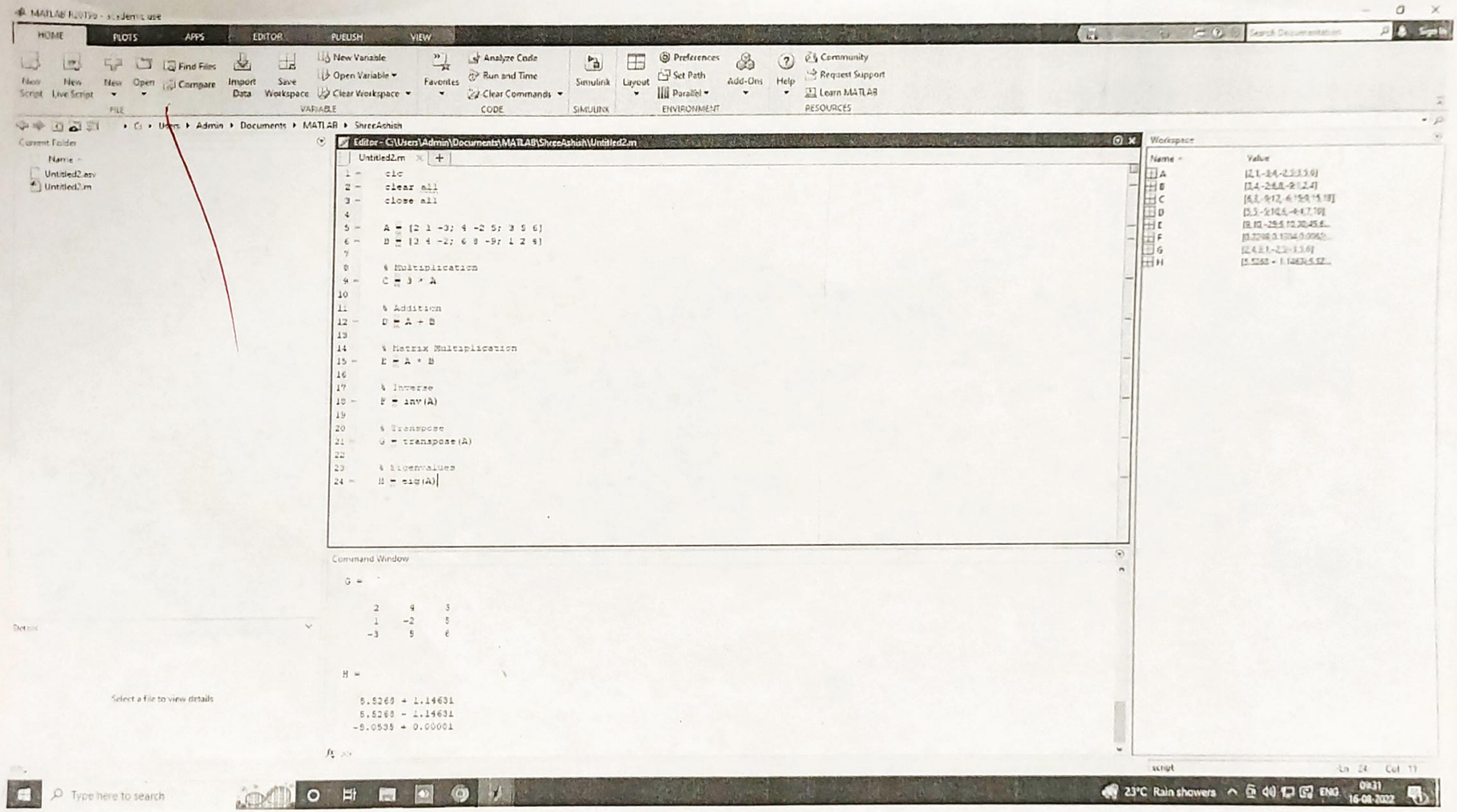
Attach the printouts of above codes and results obtained.
Verify above results by manual solution methods.

Post Lab Questions:

1. Explain importance of MATLAB.
2. What "clear all" and "close all" will do?
3. Write syntax to find eigen values, eigen vector and rank of a matrix.


operations
Editor - C:\Users\Admin\Documents\MATLAB\ShreeAshish\Untitled2.m
Untitled2.m
1 - clc
2 - clear all
3 - close all
4
5 - A = [2 1 -3; 4 -2 5; 3 5 6]
6 - B = [3 4 -2; 6 3 -9; 1 2 4]
7
8 % Multiplication
9 - C = 3 * A
10
11 % Addition
12 - D = A + B
13
14 % Matrix Multiplication
15 - E = A * B
16
17 % Inverse
18 - F = inv(A)
19
20 % Transpose
21 - G = transpose(A)
Command Window
A =
2 1 -3
4 -2 5
3 5 6
B =


HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Editor - C:\Users\Admin\Documents\MATLAB\ShreeAshish\Untitled2.m
Command Window
A =
2 1 -3
4 -2 5
3 5 6
B =
3 4 -2
6 5 -9
1 2 4
C =
6 3 -9
12 -6 15
9 15 18
D =
5 5 -5
10 6 -4
4 7 10
E =
9 10 -25
5 10 30
65 69 -27
F =
0.2298 0.1304 0.0962
0.0559 -0.1304 0.1366
-0.1615 0.0435 0.0497
Results
Select a file to view details
Type here to search


HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
New Script
New Live Script
New
Open
Find Files
Compare
Import Data
Save Workspace
New Variable
Open Variable
Clear Workspace
Favorites
Analyze Code
Run and Time
Clear Commands
Simulink
Layout
Preferences
Set Path
Parallel
Add-Ons
Help
Community
Request Support
Learn MATLAB
FILE
VARIABLE
CODE
SIMULINK
ENVIRONMENT
RESOURCES
C: ▸ Users ▸ Admin ▸ Documents ▸ MATLAB ▸ ShreeAshish
Current Folder
Name
Untitled2.asv
Untitled2.m
Editor - C:\Users\Admin\Documents\MATLAB\ShreeAshish\Untitled2.m
Untitled2.m
1 clc
2 clear all
3 close all
4
5 A = [2 1 -3; 4 -2 5; 3 5 6]
6 B = [3 4 -2; 6 8 -9; 1 2 4]
7
8 % Multiplication
9 C = 3 * A
10
11 % Addition
12 D = A + B
13
14 % Matrix Multiplication
15 E = A * B
16
17 % Inverse
18 F = inv(A)
19
20 % Transpose
21 G = transpose(A)
22
23 % Eigenvalues
24 H = eig(A)
Command Window
G =
2 4 3
1 -2 5
-3 5 6
H =
5.5268 + 1.14631
5.5268 - 1.14631
-5.0535 + 0.00001
Workspace
Name
Value
A
B
C
D
E
F
G
H
Select a file to view details
script
Ln 24 Col 11
Type here to search
23°C Rain showers
ENG
09:31
16-08-2022

* Calculations :-

$$A = \begin{bmatrix} 2 & 1 & -3 \\ 4 & -2 & 5 \\ 3 & 5 & 6 \end{bmatrix} \qquad B = \begin{bmatrix} 3 & 4 & -2 \\ 6 & 8 & -9 \\ 1 & 2 & 4 \end{bmatrix}$$

% Multiplication

$$C = 3 \times A = \begin{bmatrix} 6 & 3 & -9 \\ 12 & -6 & 15 \\ 9 & 15 & 18 \end{bmatrix}$$

% Addition

$$D = A + B = \begin{bmatrix} 5 & 5 & -5 \\ 10 & +6 & -4 \\ 4 & 7 & 10 \end{bmatrix}$$

% Matrix Multiplication

$$E = A \times B = \begin{bmatrix} 2 & 1 & -3 \\ 4 & -2 & 5 \\ 3 & 5 & 6 \end{bmatrix} \times \begin{bmatrix} 3 & 4 & -2 \\ 6 & 8 & -9 \\ 1 & 2 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} 9 & 10 & -25 \\ 5 & 10 & 30 \\ 45 & 64 & -27 \end{bmatrix}$$

% Inverse

$$F = A^{-1} = \begin{bmatrix} 37/161 & 3/23 & 1/161 \\ 9/161 & -3/23 & 22/161 \\ -26/161 & 1/23 & 8/161 \end{bmatrix}$$

% Transpose

$$G = A^T = \begin{bmatrix} 2 & 4 & 3 \\ 1 & -2 & 5 \\ -3 & 5 & 6 \end{bmatrix}$$

% Eigen values

$H = \text{eig } A =$

$\lambda_1 = 5.526 + 1.146i$

$\lambda_2 = 5.2676 - 1.1463i$

$\lambda_3 = -5.053$

* Post Lab Questions:

Q 1) Explain importance of MATLAB.

→ MATLAB is used to check for equation solutions, integrations, derivations and to optimize results in design problems that involve multiple varying parameters. we can also use it in their laboratory classes to process experimental data and to make plots to visualize experiments and extract conclusions.

Q 2) what "clear all" and "close all" will do?

→ • "clear all" - it will clears your workspace, close all figures, and clears command window.
• "close all" - it will close all windows like graph, image etc.

Q 3) write syntax to find eigen values, eigen vector and rank of a matrix

→ ① Eigen values: e = eig(A)

② Eigen vector: e = eig(A,B) ... (A,B are vectors)

③ Rank of a matrix: K = rank(A)