LINEAR ALGEBRA

LAB REPORT

(23MAT117)

AMRITA SCHOOL OF COMPUTING

AMRITA VISHWA VIDYAPEETHAM, AMARAVATI CAMPUS

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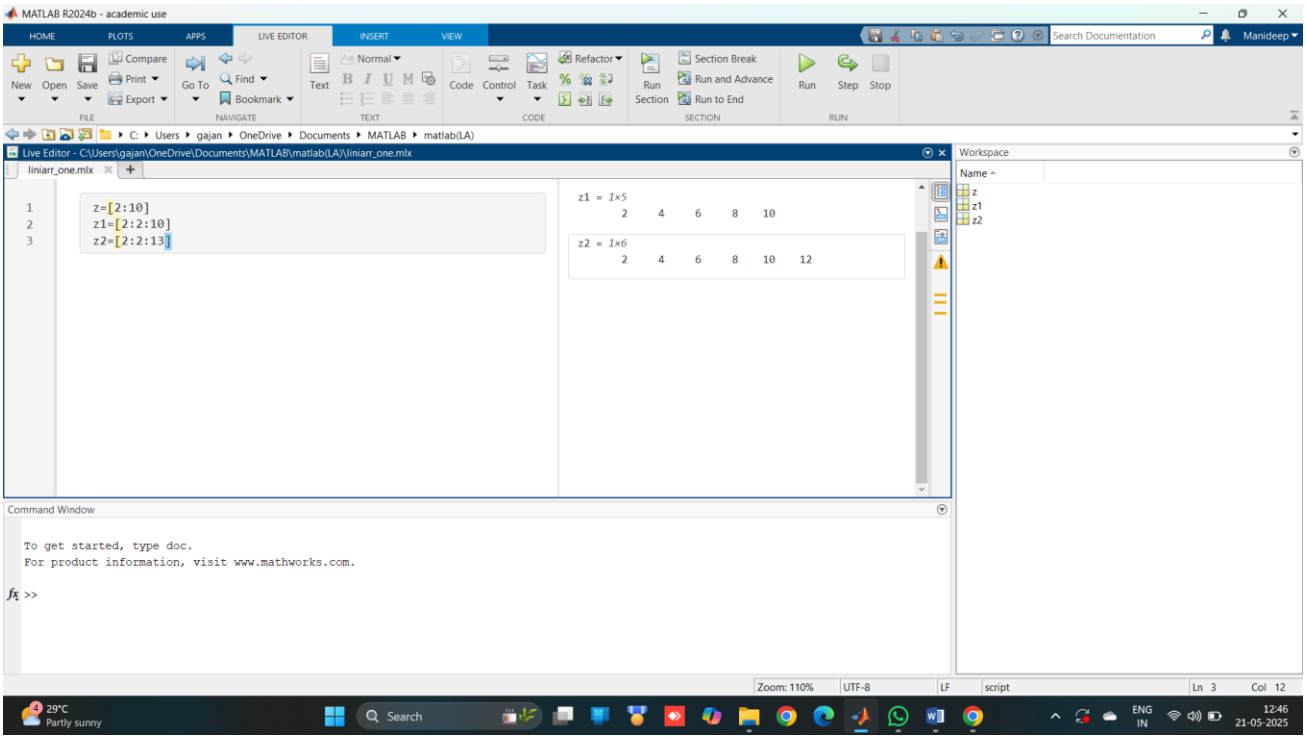
Section: CSE-B

Roll No: av.sc.u4cse24108

Semester: 1st semester


MATLAB R2024b - academic use
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APPS
LIVE EDITOR
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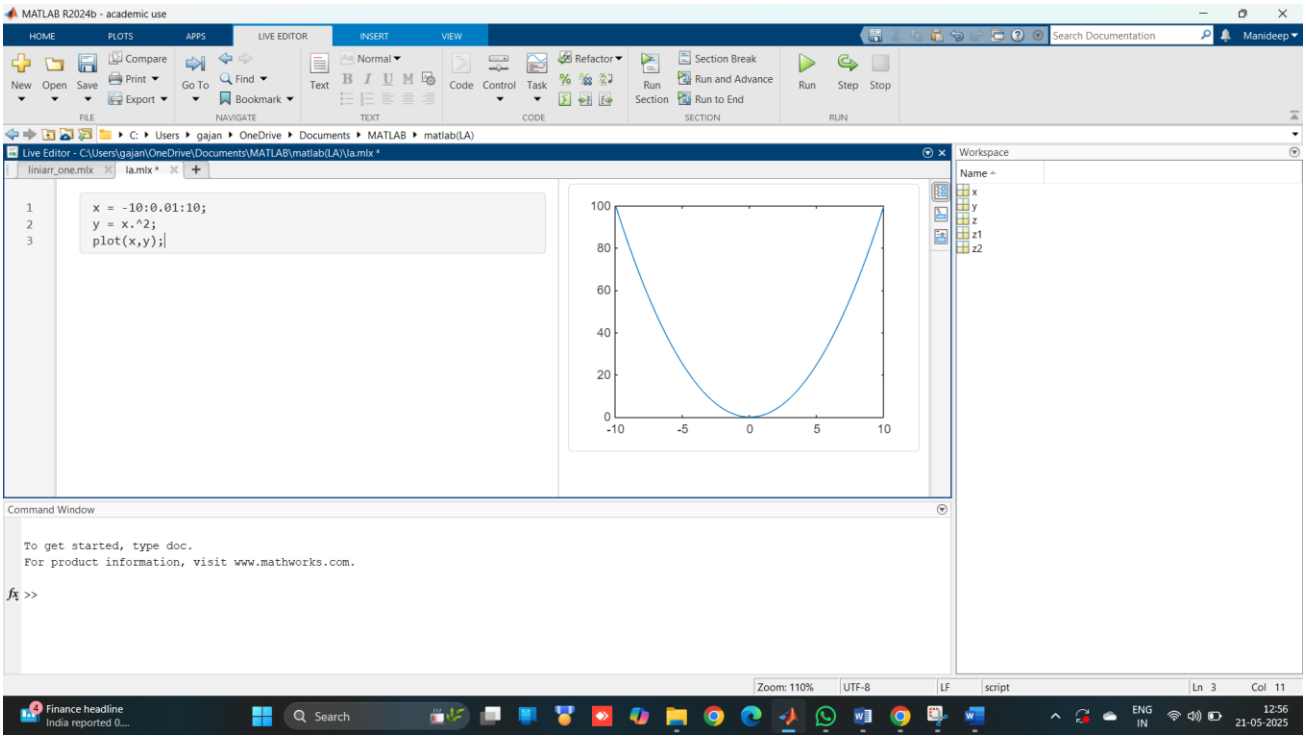
Print
Export
Go To
Find
Bookmark
Text
Normal
Code
Control
Task
Refactor
Run Section
Section Break
Run and Advance
Run to End
Run
Step
Stop
FILE
NAVIGATE
TEXT
CODE
SECTION
RUN
C: ▸ Users ▸ gajan ▸ OneDrive ▸ Documents ▸ MATLAB ▸ matlab(LA)
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\liniarr_one.mlx
liniarr_one.mlx
1 z=[2:10]
2 z1=[2:2:10]
3 z2=[2:2:13]
z1 = 1×5
2 4 6 8 10
z2 = 1×6
2 4 6 8 10 12
Workspace
Name
z
z1
z2
Command Window
To get started, type doc.
For product information, visit www.mathworks.com.
>>
Zoom: 110%
UTF-8
LF
script
Ln 3
Col 12
29°C
Partly sunny
Search
ENG
IN
12:46
21-05-2025


MATLAB R2024b - academic use
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Go To
Find
Bookmark
Text
Normal
Code
Control
Task
Refactor
Section Break
Run and Advance
Run to End
Run Section
Run
Step
Stop
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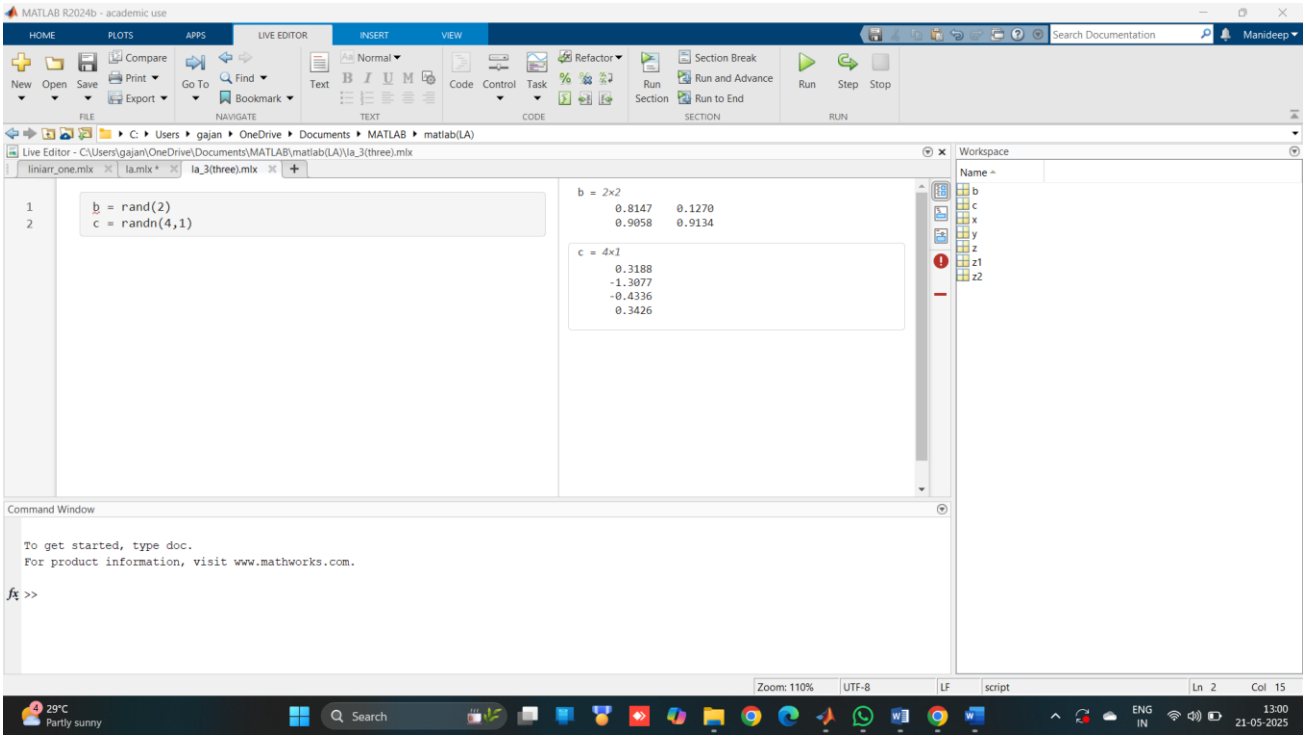
NAVIGATE
TEXT
CODE
SECTION
RUN
C: ▸ Users ▸ gajan ▸ OneDrive ▸ Documents ▸ MATLAB ▸ matlab(LA)
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la.mlx *
liniarr_one.mlx
la.mlx *
1 x = -10:0.01:10;
2 y = x.^2;
3 plot(x,y);
100
80
60
40
20
0
-10
-5
0
5
10
Workspace
Name
x
y
z
z1
z2
Command Window
To get started, type doc.
For product information, visit www.mathworks.com.
fx >>
Zoom: 110%
UTF-8
LF
script
Ln 3
Col 11
Finance headline
India reported 0....
Search
ENG
IN
12:56
21-05-2025


MATLAB R2024b - academic use
HOME
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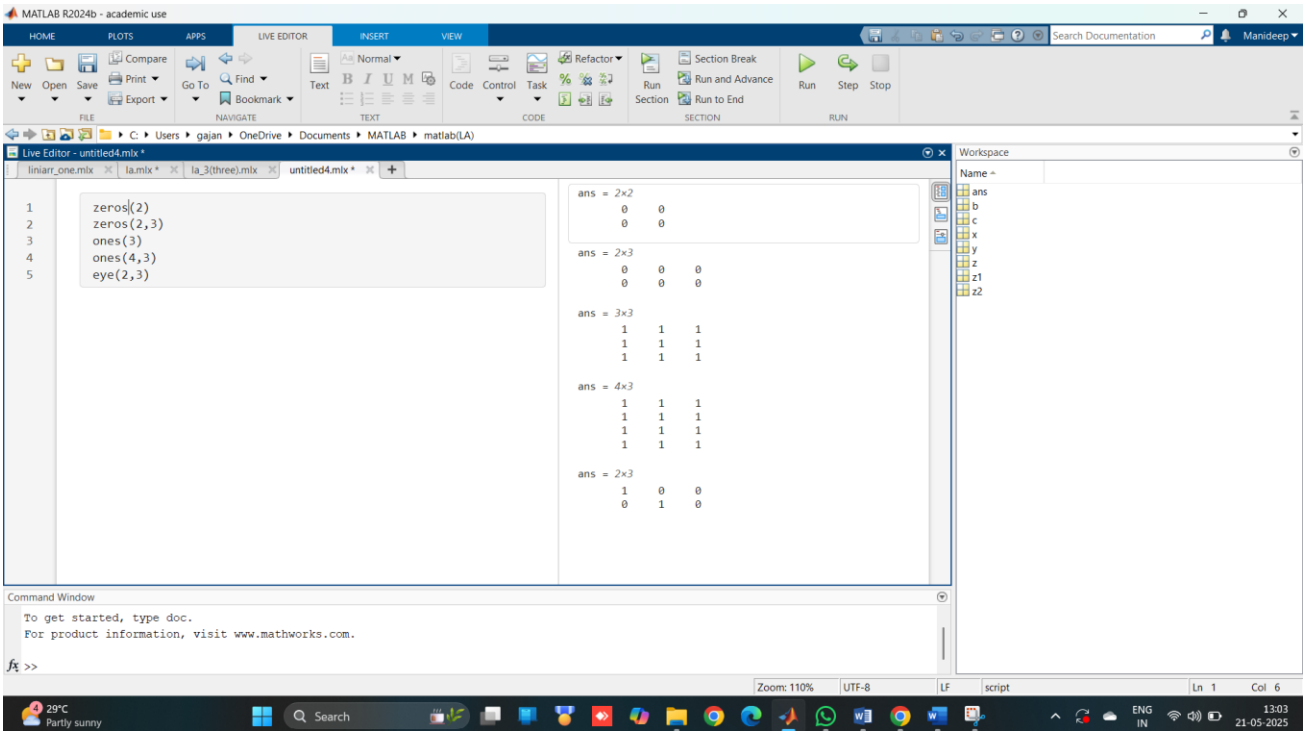
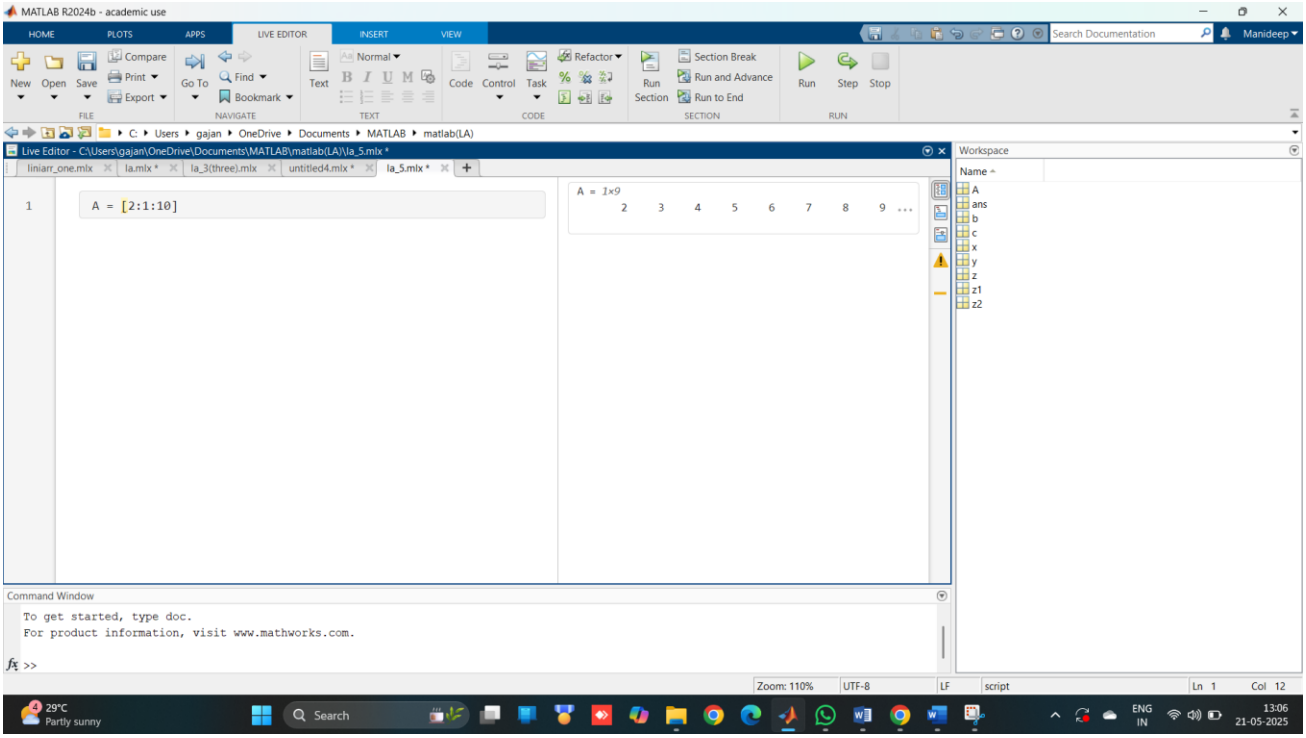
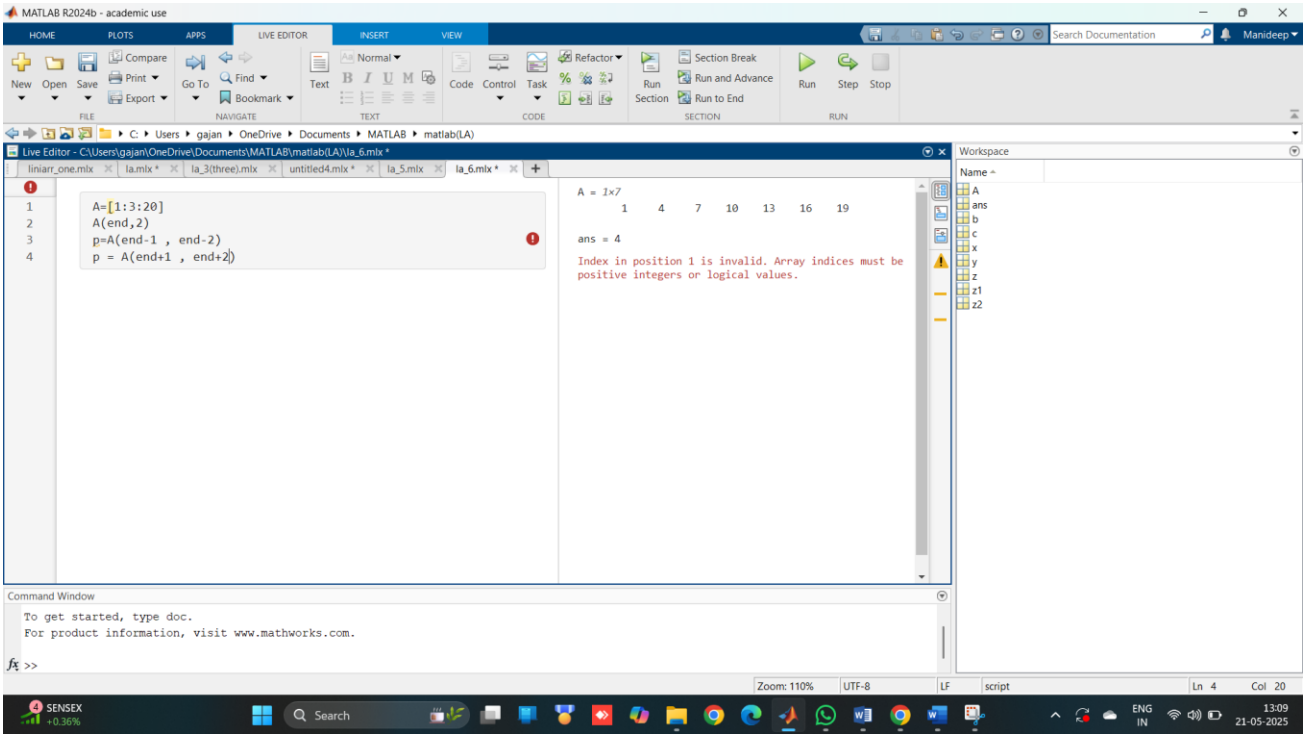
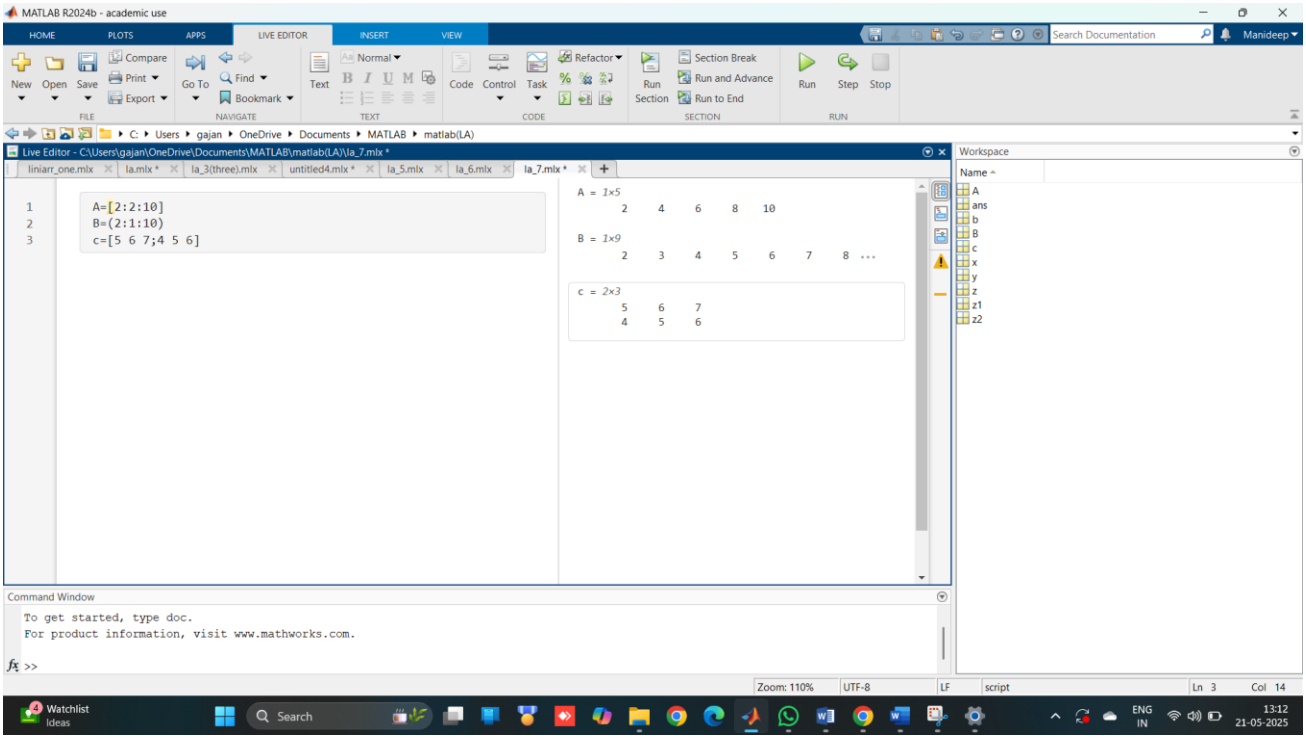
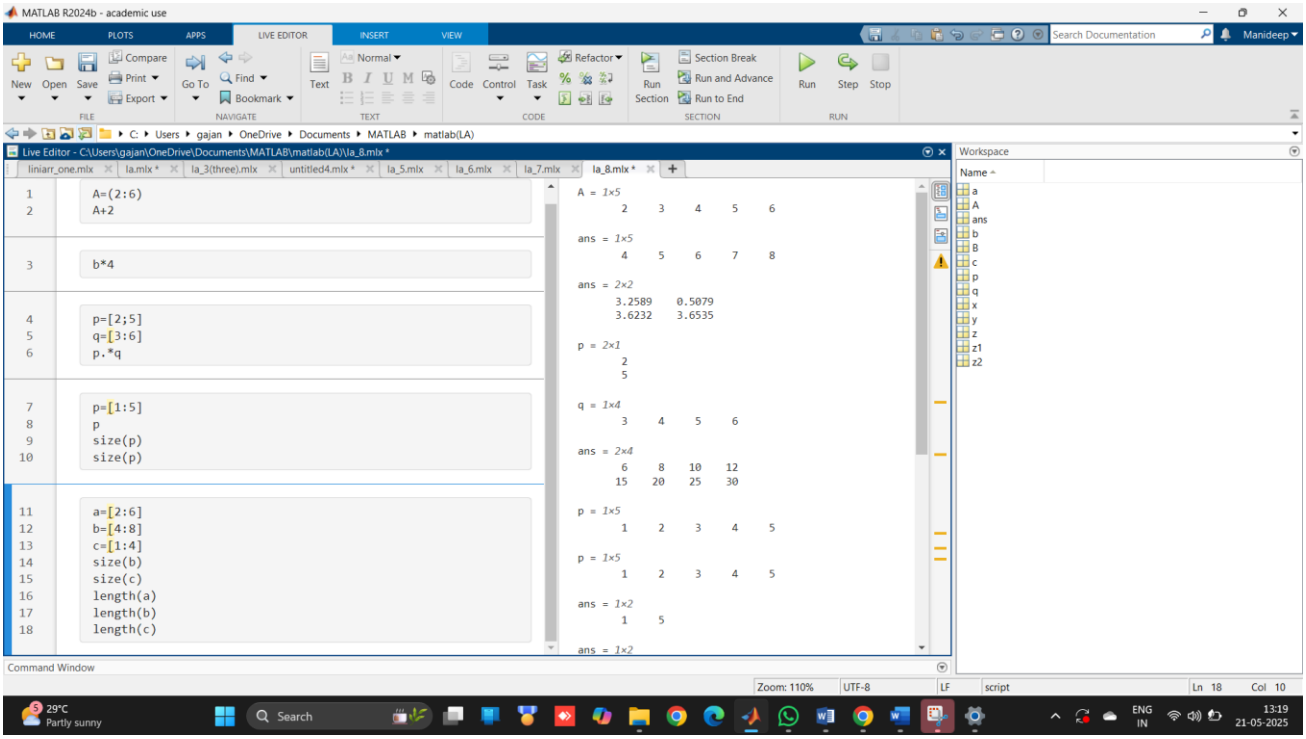
Manideep
New
Open
Save
Compare
Print
Export
Go To
Find
Bookmark
Text
Normal
Code
Control
Task
Refactor
Section Break
Run and Advance
Run to End
Run Section
Run
Step
Stop
FILE
NAVIGATE
TEXT
CODE
SECTION
RUN
C: ▸ Users ▸ gajan ▸ OneDrive ▸ Documents ▸ MATLAB ▸ matlab(LA)
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_3(three).mlx
liniarr_one.mlx
la.mlx *
la_3(three).mlx
1 b = rand(2)
2 c = randn(4,1)
b = 2×2
0.8147 0.1270
0.9058 0.9134
c = 4×1
0.3188
-1.3077
-0.4336
0.3426
Workspace
Name
b
c
x
y
z
z1
z2
Command Window
To get started, type doc.
For product information, visit www.mathworks.com.
fx >>
Zoom: 110%
UTF-8
LF
script
Ln 2
Col 15
29°C
Partly sunny
Search
ENG
IN
13:00
21-05-2025


MATLAB R2024b - academic use
Live Editor - untitled4.mlx *
zeros(2)
zeros(2,3)
ones(3)
ones(4,3)
eye(2,3)
ans = 2×2
0 0
0 0
ans = 2×3
0 0 0
0 0 0
ans = 3×3
1 1 1
1 1 1
1 1 1
ans = 4×3
1 1 1
1 1 1
1 1 1
1 1 1
ans = 2×3
1 0 0
0 1 0
Command Window
To get started, type doc.
For product information, visit www.mathworks.com.
Workspace
ans
b
c
x
y
z
z1
z2

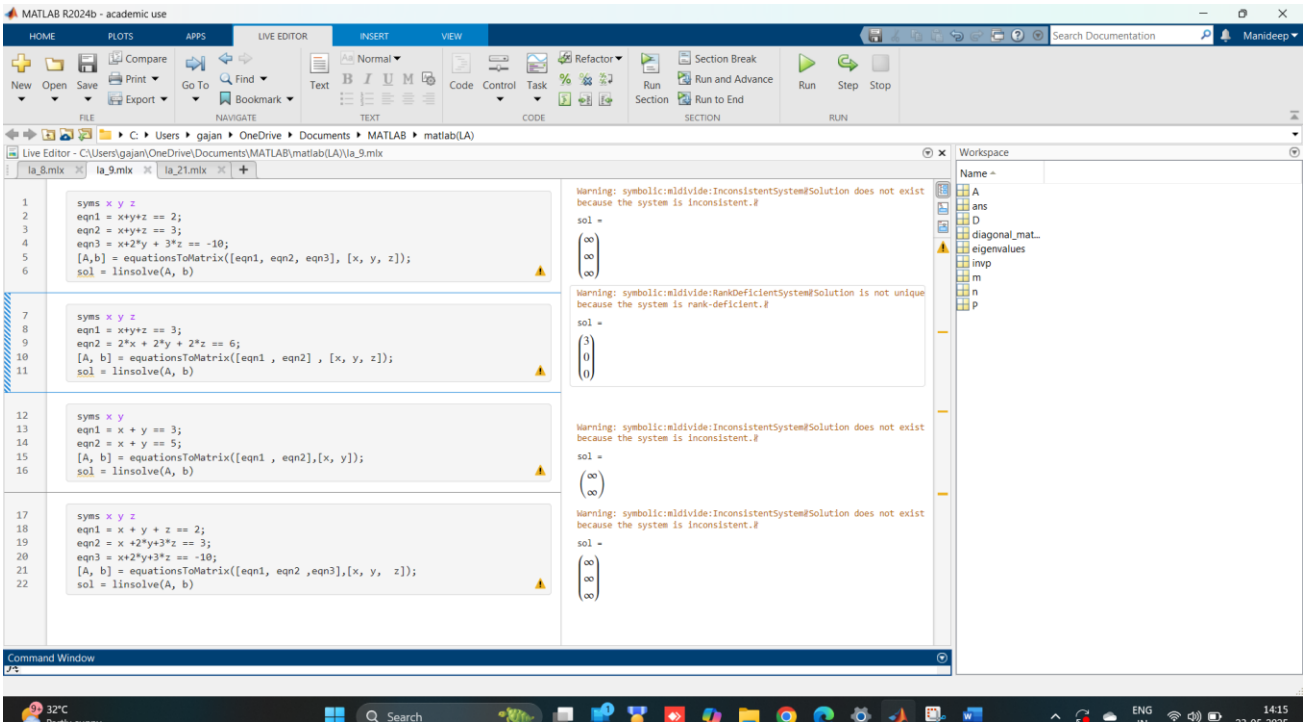

MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_5.mlx *
A = [2:1:10]
A = 1×9
2 3 4 5 6 7 8 9 ...
Command Window
To get started, type doc.
For product information, visit www.mathworks.com.
Workspace
A
ans
b
c
x
y
z
z1
z2

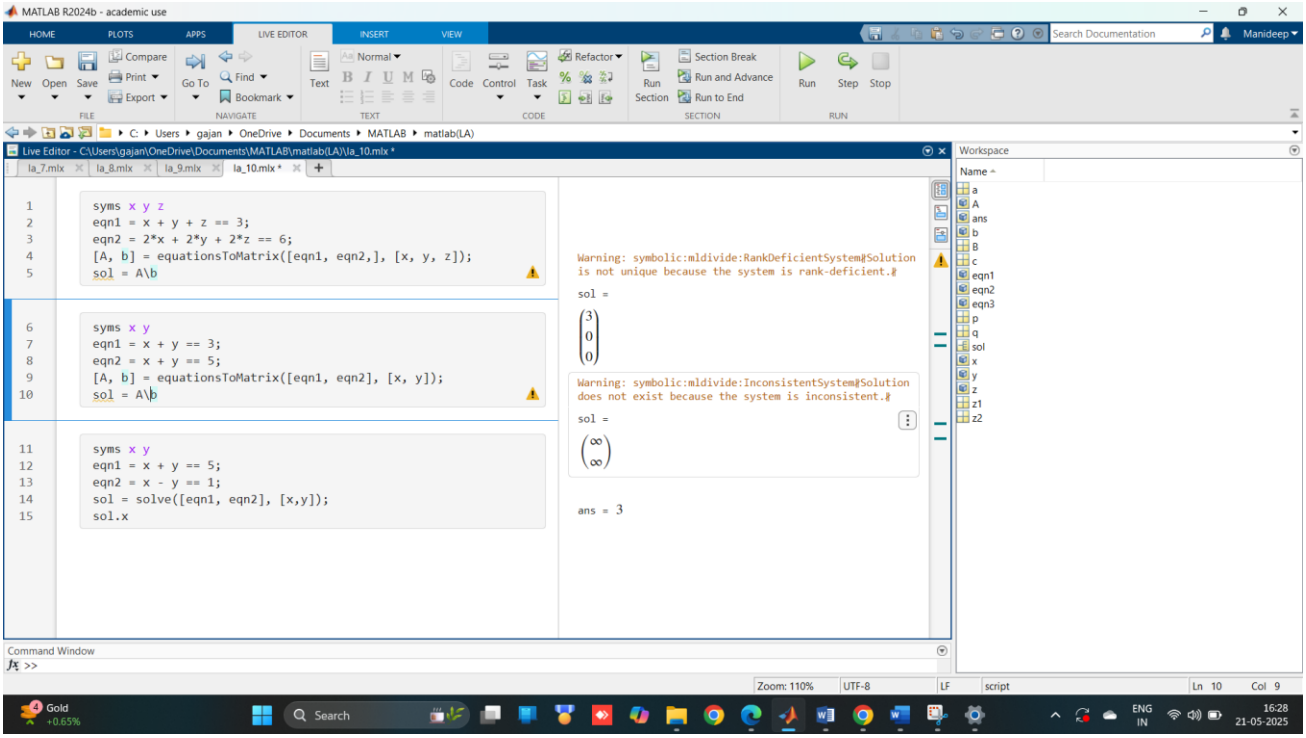

MATLAB R2024b - academic use
A=[1:3:20]
A(end,2)
p=A(end-1 , end-2)
p = A(end+1 , end+2)
A = 1×7
1 4 7 10 13 16 19
ans = 4
Index in position 1 is invalid. Array indices must be positive integers or logical values.
To get started, type doc.
For product information, visit www.mathworks.com.

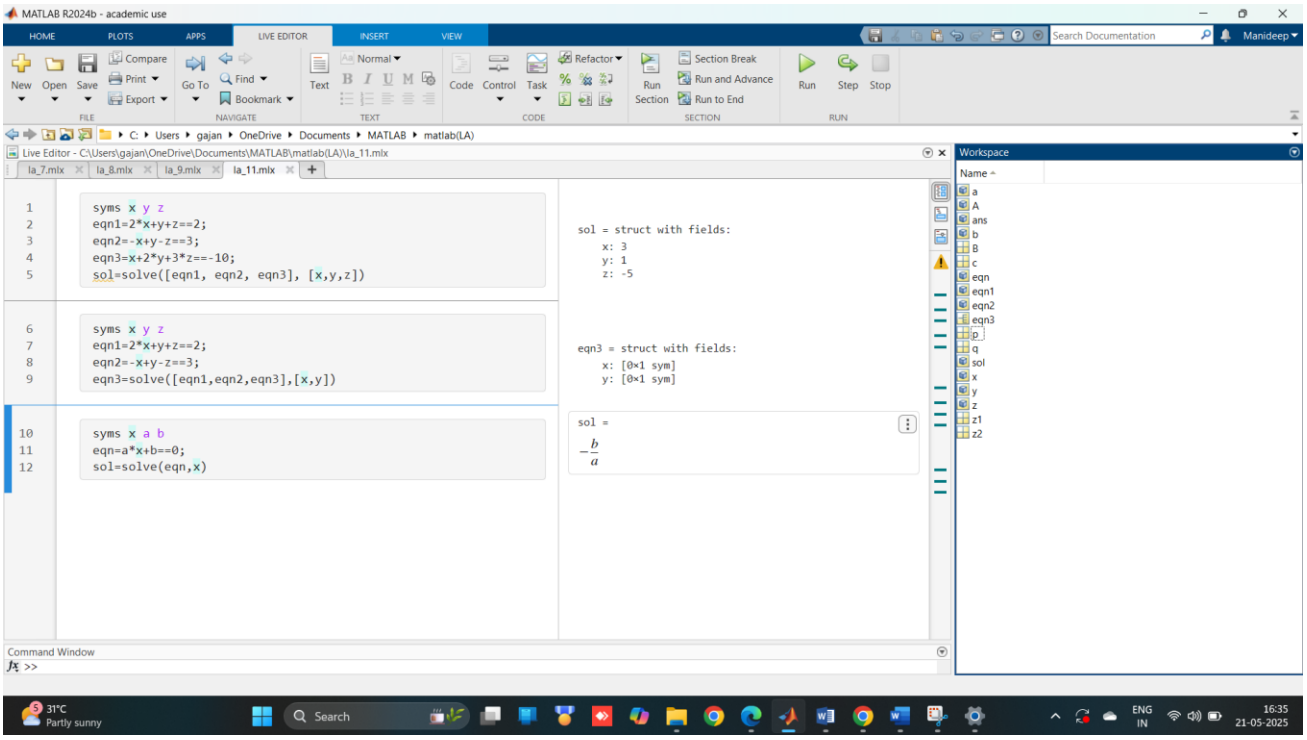

MATLAB R2024b - academic use
A=[2:2:10]
B=(2:1:10)
c=[5 6 7;4 5 6]
A = 1×5
2 4 6 8 10
B = 1×9
2 3 4 5 6 7 8 ...
c = 2×3
5 6 7
4 5 6
To get started, type doc.
For product information, visit www.mathworks.com.

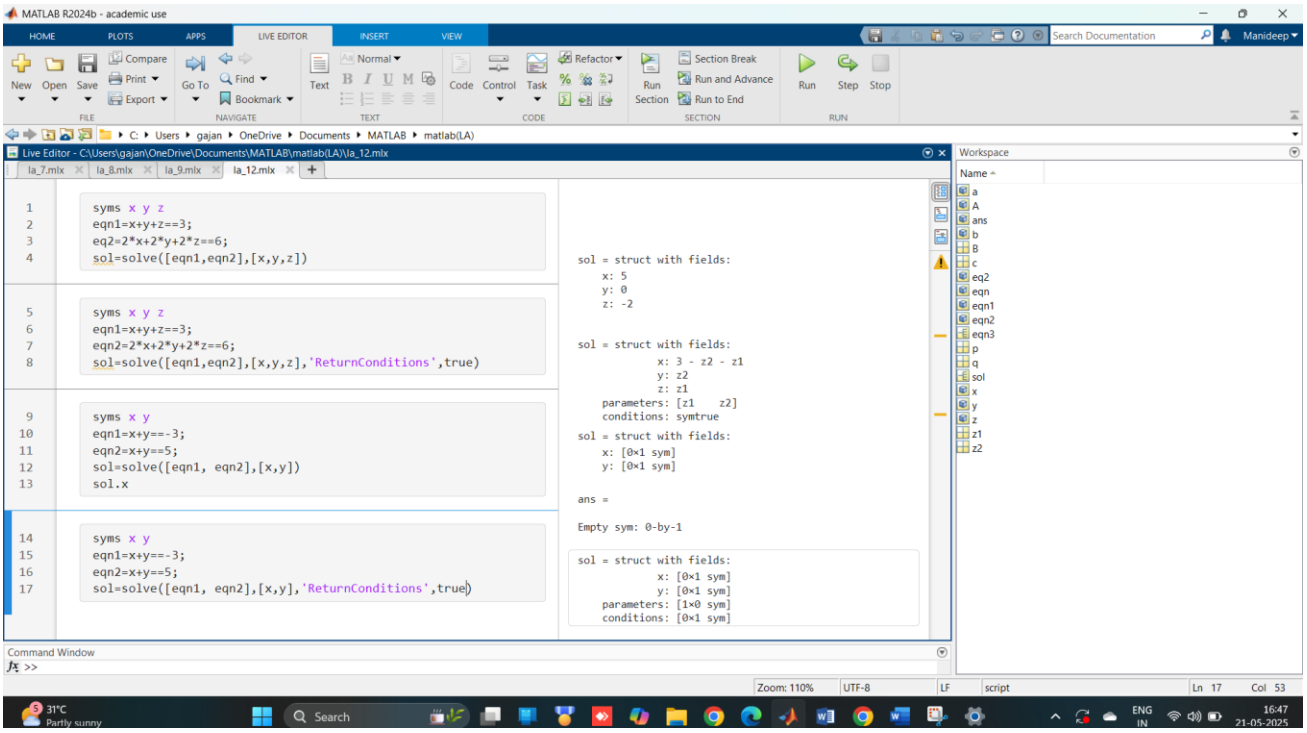


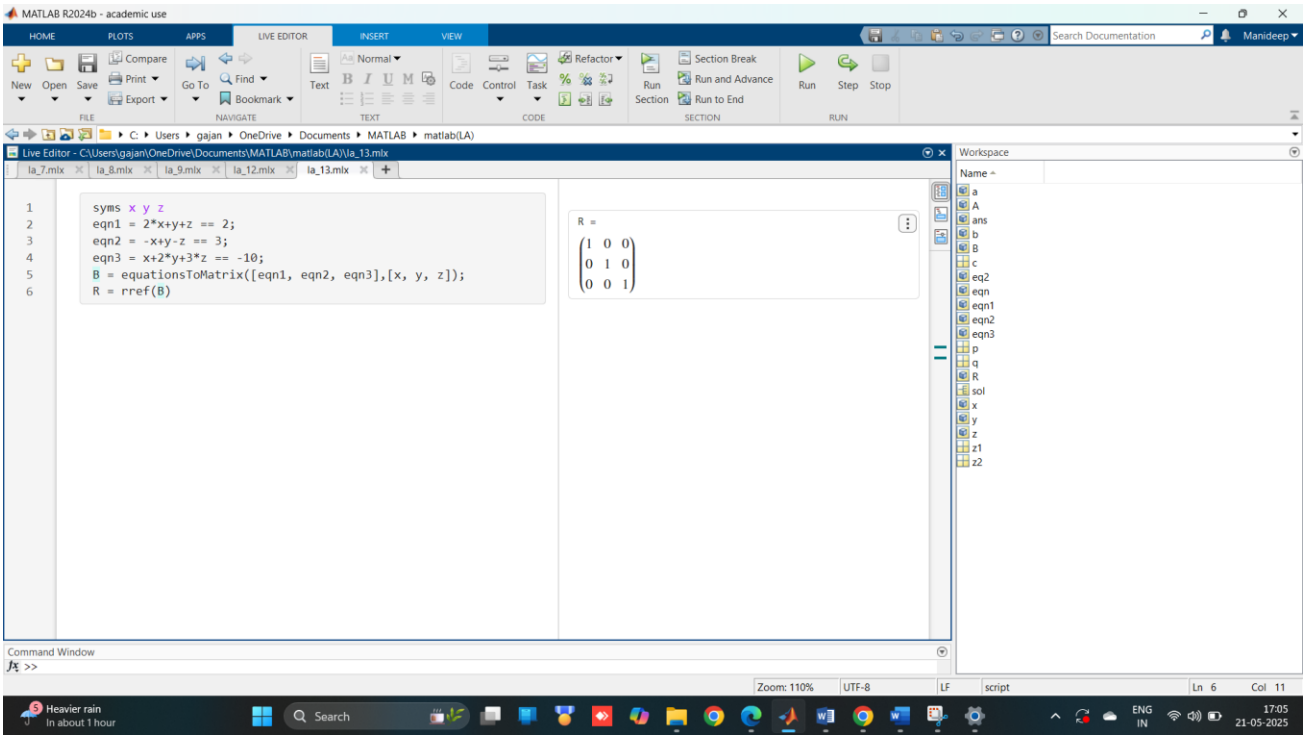

```
ans = 1×2
     1     5

a = 1×5
     2     3     4     5     6

b = 1×5
     4     5     6     7     8

c = 1×4
     1     2     3     4

ans = 1×2
     1     5

ans = 1×2
     1     4

ans = 5

ans = 5

ans = 4
```

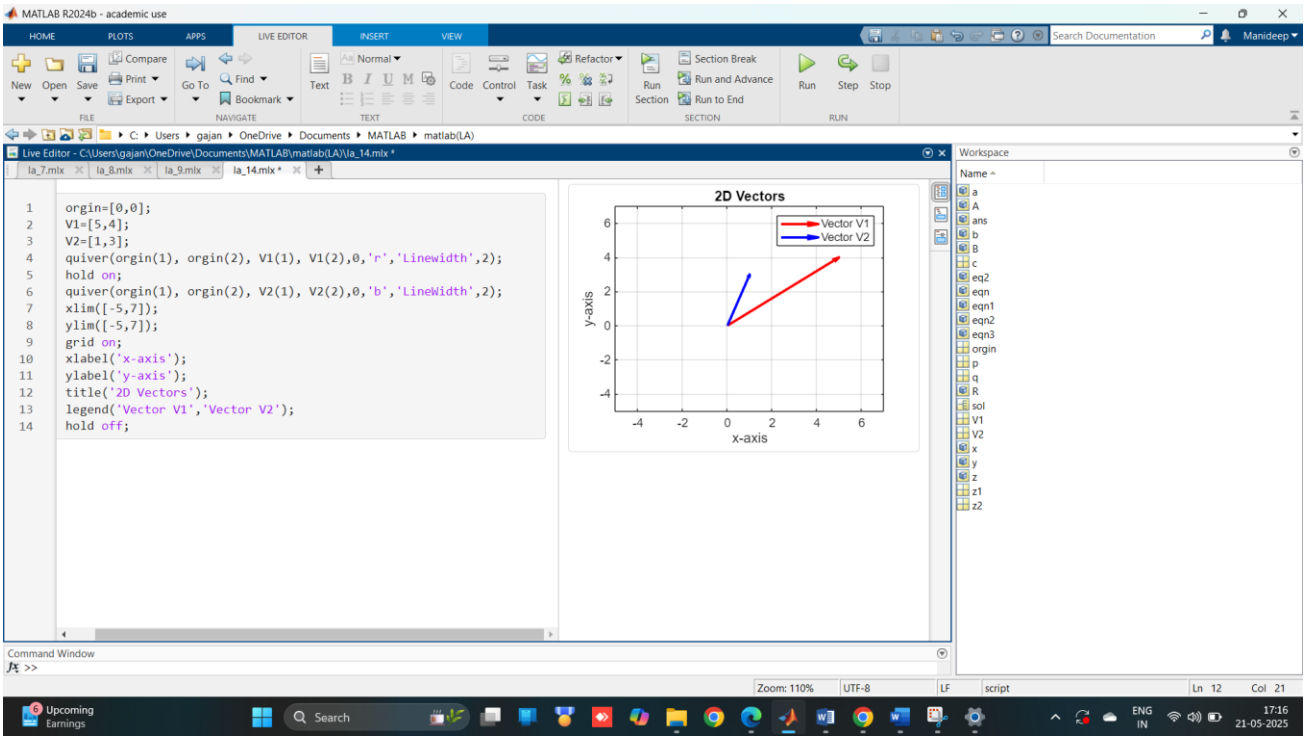

MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_9.mlx
la_8.mlx
la_9.mlx
la_21.mlx
syms x y z
eqn1 = x+y+z == 2;
eqn2 = x+y+z == 3;
eqn3 = x+2*y + 3*z == -10;
[A,b] = equationsToMatrix([eqn1, eqn2, eqn3], [x, y, z]);
sol = linsolve(A, b)
Warning: symbolic:mldivide:InconsistentSystem#Solution does not exist because the system is inconsistent.#
sol =
syms x y z
eqn1 = x+y+z == 3;
eqn2 = 2*x + 2*y + 2*z == 6;
[A, b] = equationsToMatrix([eqn1 , eqn2] , [x, y, z]);
sol = linsolve(A, b)
Warning: symbolic:mldivide:RankDeficientSystem#Solution is not unique because the system is rank-deficient.#
sol =
syms x y
eqn1 = x + y == 3;
eqn2 = x + y == 5;
[A, b] = equationsToMatrix([eqn1 , eqn2],[x, y]);
sol = linsolve(A, b)
Warning: symbolic:mldivide:InconsistentSystem#Solution does not exist because the system is inconsistent.#
sol =
syms x y z
eqn1 = x + y + z == 2;
eqn2 = x +2*y+3*z == 3;
eqn3 = x+2*y+3*z == -10;
[A, b] = equationsToMatrix([eqn1, eqn2 ,eqn3],[x, y, z]);
sol = linsolve(A, b)
Warning: symbolic:mldivide:InconsistentSystem#Solution does not exist because the system is inconsistent.#
sol =
Command Window
Workspace
A
ans
D
diagonal_mat...
eigenvalues
invp
m
n
p

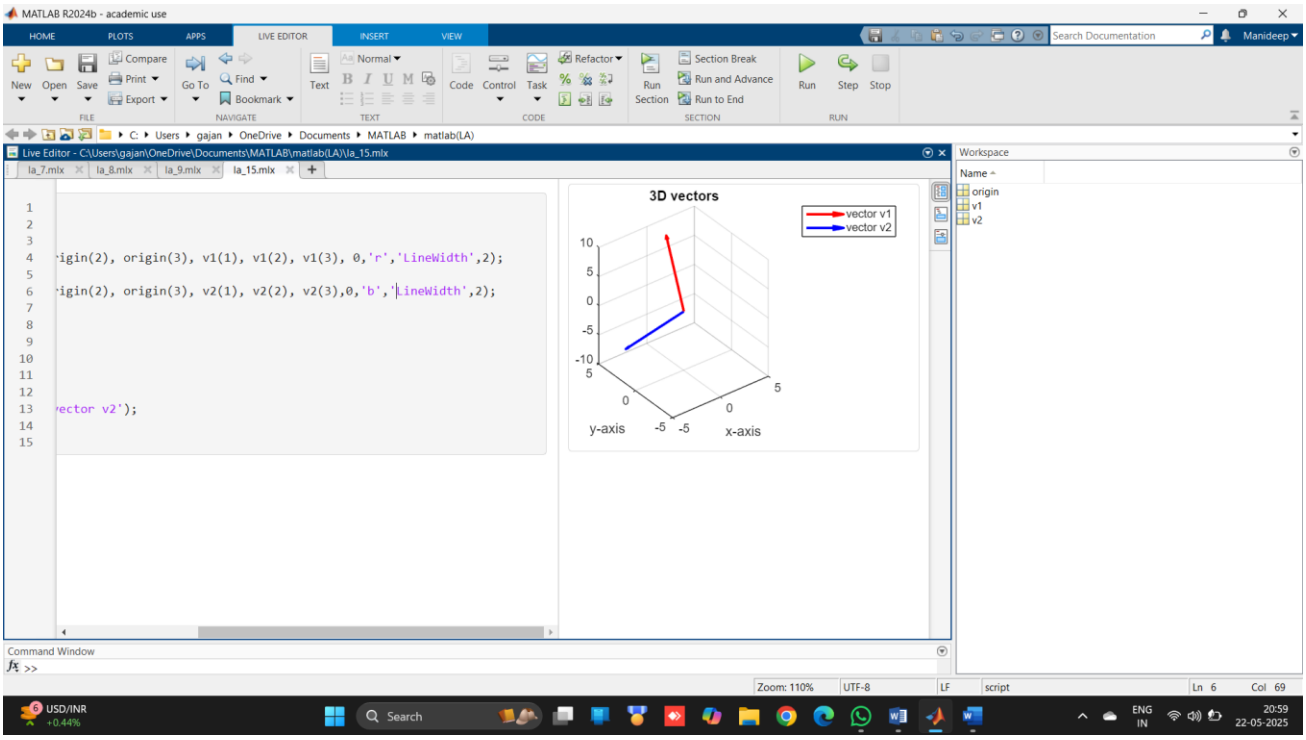

MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_10.mlx *
la_7.mlx
la_8.mlx
la_9.mlx
la_10.mlx *
syms x y z
eqn1 = x + y + z == 3;
eqn2 = 2*x + 2*y + 2*z == 6;
[A, b] = equationsToMatrix([eqn1, eqn2,], [x, y, z]);
sol = A\b
Warning: symbolic:mldivide:RankDeficientSystem#Solution is not unique because the system is rank-deficient.#
sol =
syms x y
eqn1 = x + y == 3;
eqn2 = x + y == 5;
[A, b] = equationsToMatrix([eqn1, eqn2], [x, y]);
sol = A\b
Warning: symbolic:mldivide:InconsistentSystem#Solution does not exist because the system is inconsistent.#
sol =
syms x y
eqn1 = x + y == 5;
eqn2 = x - y == 1;
sol = solve([eqn1, eqn2], [x,y]);
sol.x
ans = 3
Command Window
Workspace
a
A
ans
b
B
c
eqn1
eqn2
eqn3
p
q
sol
x
y
z
z1
z2

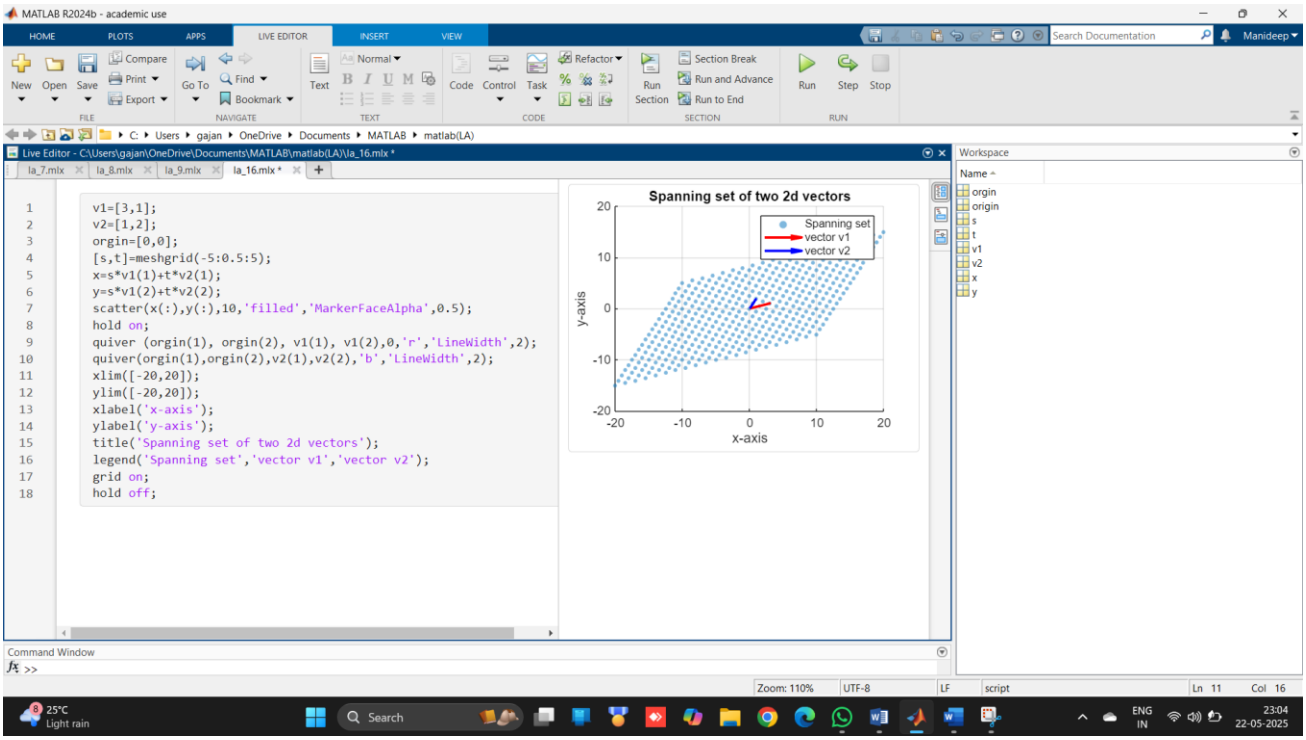

MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_11.mlx
la_7.mlx
la_8.mlx
la_9.mlx
la_11.mlx
syms x y z
eqn1=2*x+y+z==2;
eqn2=-x+y-z==3;
eqn3=x+2*y+3*z==-10;
sol=solve([eqn1, eqn2, eqn3], [x,y,z])
sol = struct with fields:
x: 3
y: 1
z: -5
syms x y z
eqn1=2*x+y+z==2;
eqn2=-x+y-z==3;
eqn3=solve([eqn1,eqn2,eqn3],[x,y])
eqn3 = struct with fields:
x: [0×1 sym]
y: [0×1 sym]
syms x a b
eqn=a*x+b==0;
sol=solve(eqn,x)
sol =
$-\frac{b}{a}$
Workspace
Command Window

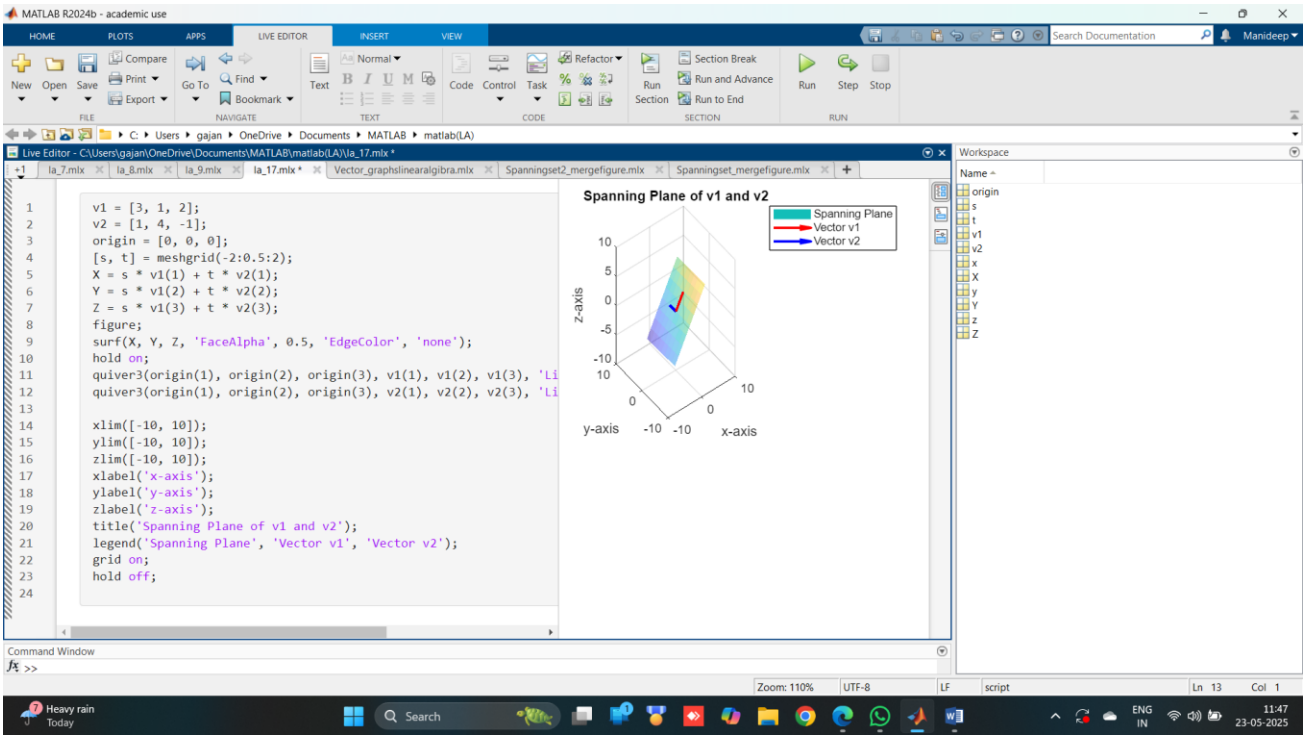

MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_12.mlx
la_7.mlx
la_8.mlx
la_9.mlx
la_12.mlx
syms x y z
eqn1=x+y+z==3;
eq2=2*x+2*y+2*z==6;
sol=solve([eqn1,eqn2],[x,y,z])
sol = struct with fields:
x: 5
y: 0
z: -2
syms x y z
eqn1=x+y+z==3;
eqn2=2*x+2*y+2*z==6;
sol=solve([eqn1,eqn2],[x,y,z],'ReturnConditions',true)
sol = struct with fields:
x: 3 - z2 - z1
y: z2
z: z1
parameters: [z1 z2]
conditions: symtrue
syms x y
eqn1=x+y==-3;
eqn2=x+y==5;
sol=solve([eqn1, eqn2],[x,y])
sol.x
sol = struct with fields:
x: [0×1 sym]
y: [0×1 sym]
ans =
Empty sym: 0-by-1
syms x y
eqn1=x+y==-3;
eqn2=x+y==5;
sol=solve([eqn1, eqn2],[x,y],'ReturnConditions',true)
sol = struct with fields:
x: [0×1 sym]
y: [0×1 sym]
parameters: [1×0 sym]
conditions: [0×1 sym]
Workspace
Command Window

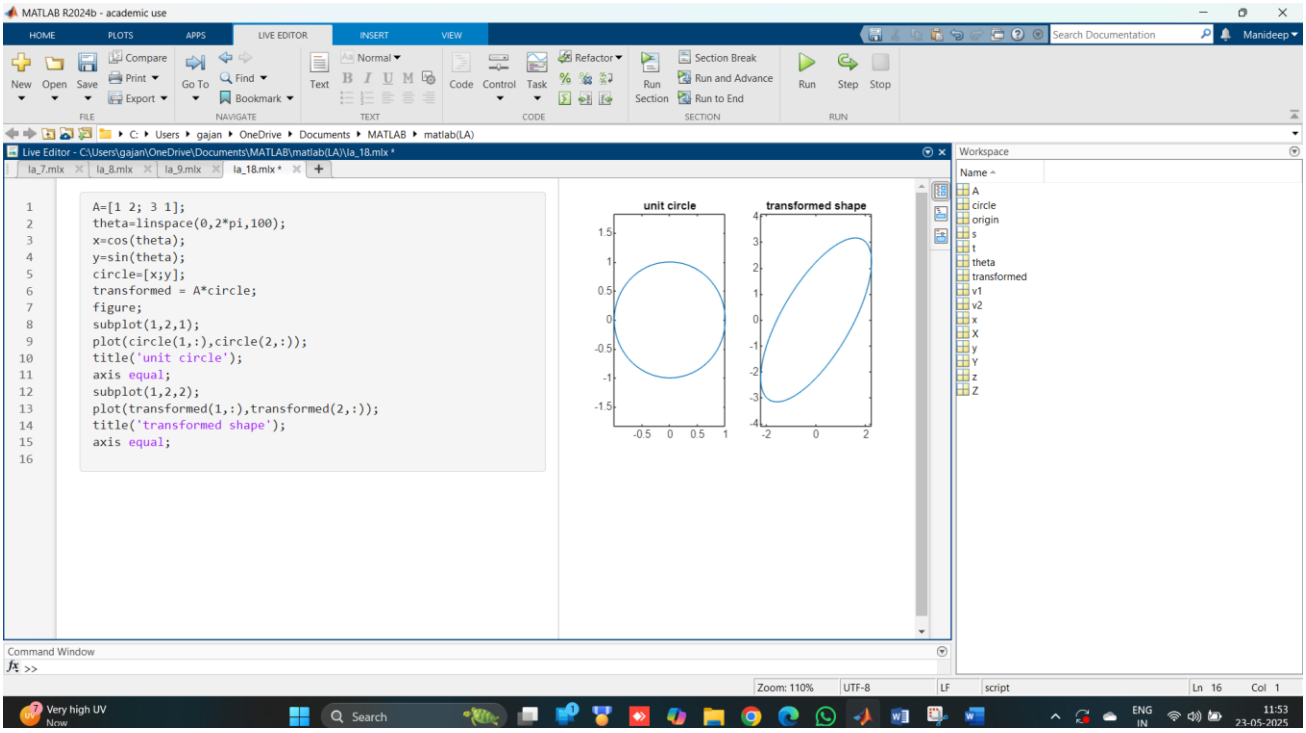

MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_13.mlx
la_7.mlx
la_8.mlx
la_9.mlx
la_12.mlx
la_13.mlx
1 syms x y z
2 eqn1 = 2*x+y+z == 2;
3 eqn2 = -x+y-z == 3;
4 eqn3 = x+2*y+3*z == -10;
5 B = equationsToMatrix([eqn1, eqn2, eqn3],[x, y, z]);
6 R = rref(B)
R =
1 0 0
0 1 0
0 0 1
Workspace
Name
a
A
ans
b
B
c
eq2
eqn
eqn1
eqn2
eqn3
p
q
R
sol
x
y
z
z1
z2
Command Window
>>
Zoom: 110%
UTF-8
LF
script
Ln 6
Col 11
Heavier rain
In about 1 hour
Search
ENG
IN
17:05
21-05-2025

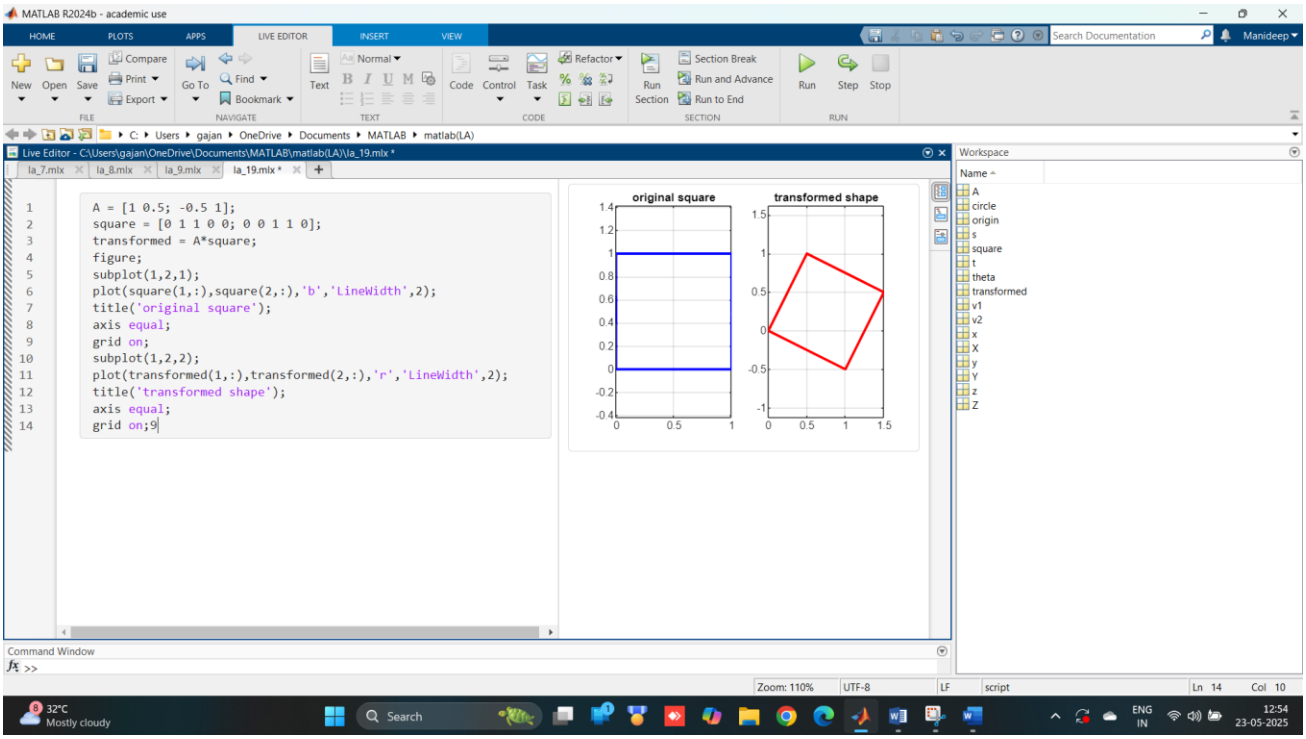

MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_14.mlx *
la_7.mlx
la_8.mlx
la_9.mlx
la_14.mlx *
1 orgin=[0,0];
2 V1=[5,4];
3 V2=[1,3];
4 quiver(orgin(1), orgin(2), V1(1), V1(2),0,'r','Linewidth',2);
5 hold on;
6 quiver(orgin(1), orgin(2), V2(1), V2(2),0,'b','LineWidth',2);
7 xlim([-5,7]);
8 ylim([-5,7]);
9 grid on;
10 xlabel('x-axis');
11 ylabel('y-axis');
12 title('2D Vectors');
13 legend('Vector V1','Vector V2');
14 hold off;
2D Vectors
Vector V1
Vector V2
y-axis
x-axis
Workspace
Name
a
A
ans
b
B
c
eq2
eqn
eqn1
eqn2
eqn3
orgin
p
q
R
sol
V1
V2
x
y
z
z1
z2
Command Window
>>
Zoom: 110%
UTF-8
LF
script
Ln 12
Col 21
Upcoming
Earnings
Search
ENG
IN
17:16
21-05-2025

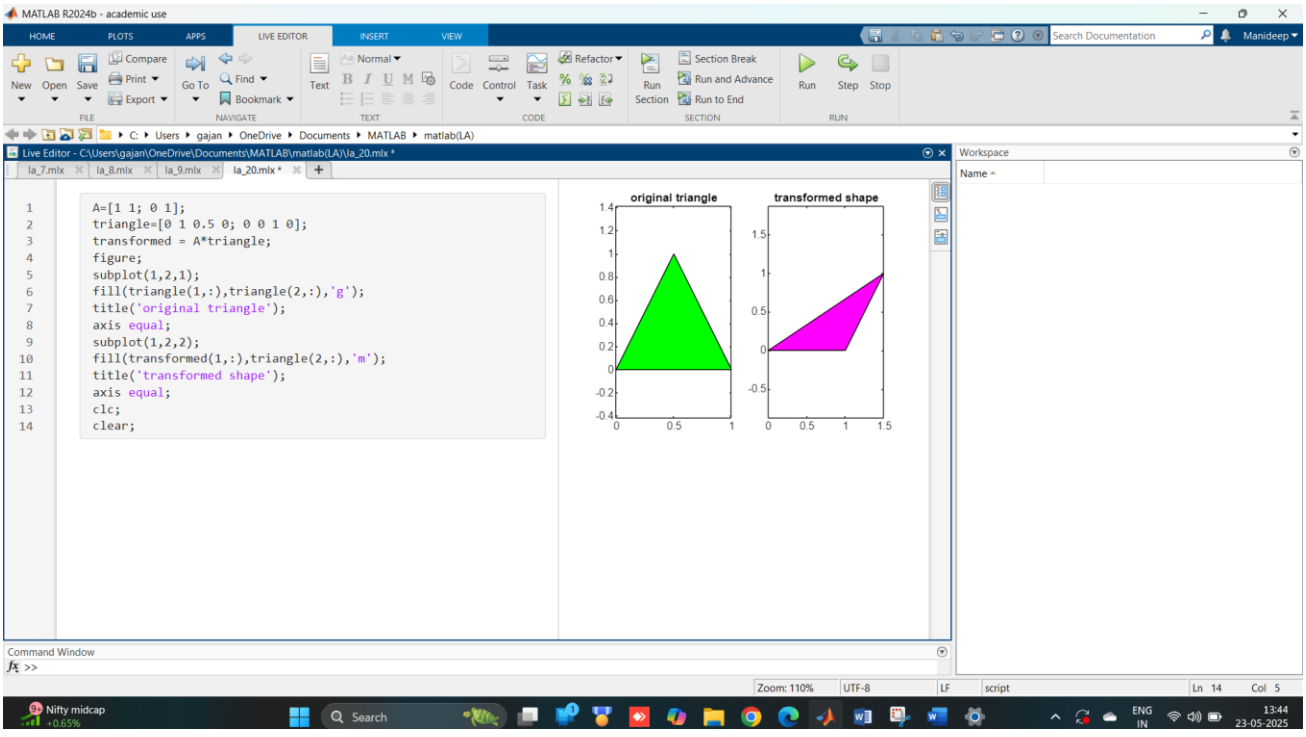

MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_15.mlx
la_7.mlx
la_8.mlx
la_9.mlx
la_15.mlx
igin(2), origin(3), v1(1), v1(2), v1(3), 0,'r','LineWidth',2);
igin(2), origin(3), v2(1), v2(2), v2(3),0,'b','LineWidth',2);
ector v2');
3D vectors
vector v1
vector v2
y-axis
x-axis
Workspace
origin
v1
v2
Command Window

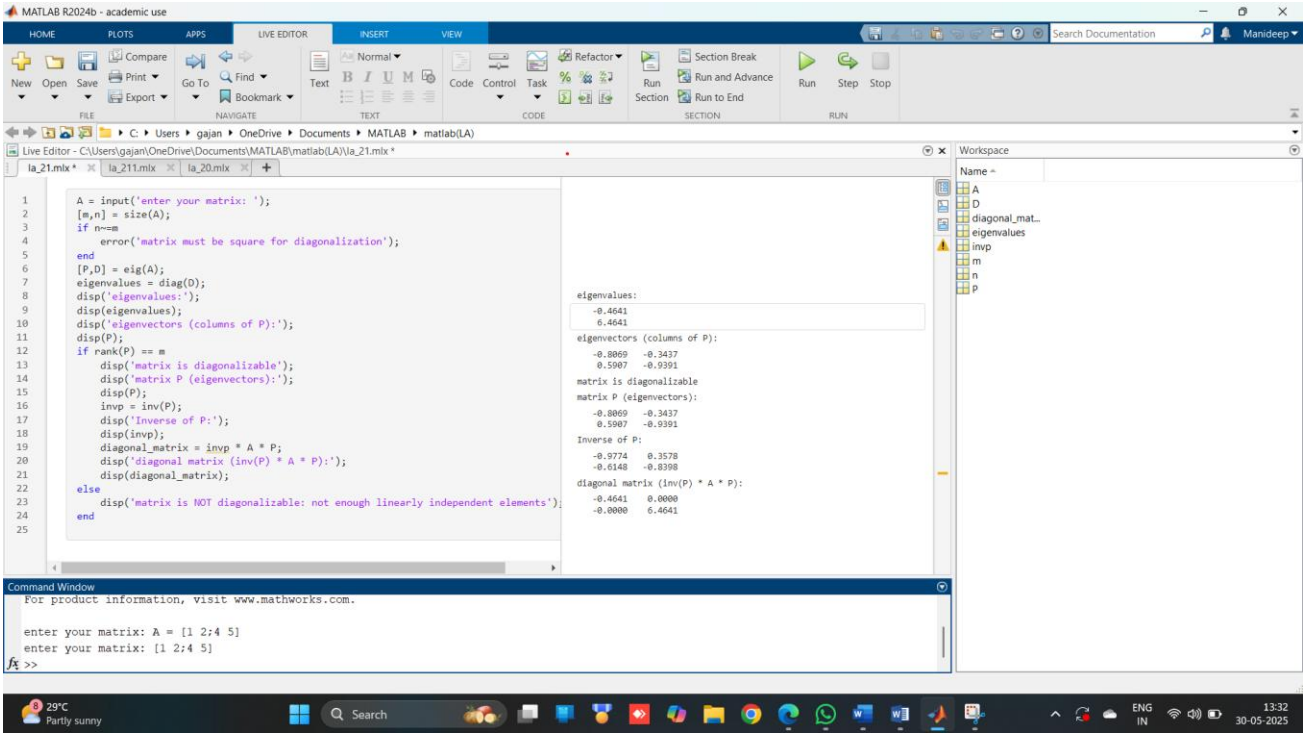

MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_16.mlx *
la_7.mlx
la_8.mlx
la_9.mlx
la_16.mlx *
v1=[3,1];
v2=[1,2];
orgin=[0,0];
[s,t]=meshgrid(-5:0.5:5);
x=s*v1(1)+t*v2(1);
y=s*v1(2)+t*v2(2);
scatter(x(:),y(:),10,'filled','MarkerFaceAlpha',0.5);
hold on;
quiver (orgin(1), orgin(2), v1(1), v1(2),0,'r','LineWidth',2);
quiver(orgin(1),orgin(2),v2(1),v2(2),'b','LineWidth',2);
xlim([-20,20]);
ylim([-20,20]);
xlabel('x-axis');
ylabel('y-axis');
title('Spanning set of two 2d vectors');
legend('Spanning set','vector v1','vector v2');
grid on;
hold off;
Spanning set of two 2d vectors
Spanning set
vector v1
vector v2
y-axis
x-axis
Workspace
orgin
origin
s
t
v1
v2
x
y
Command Window

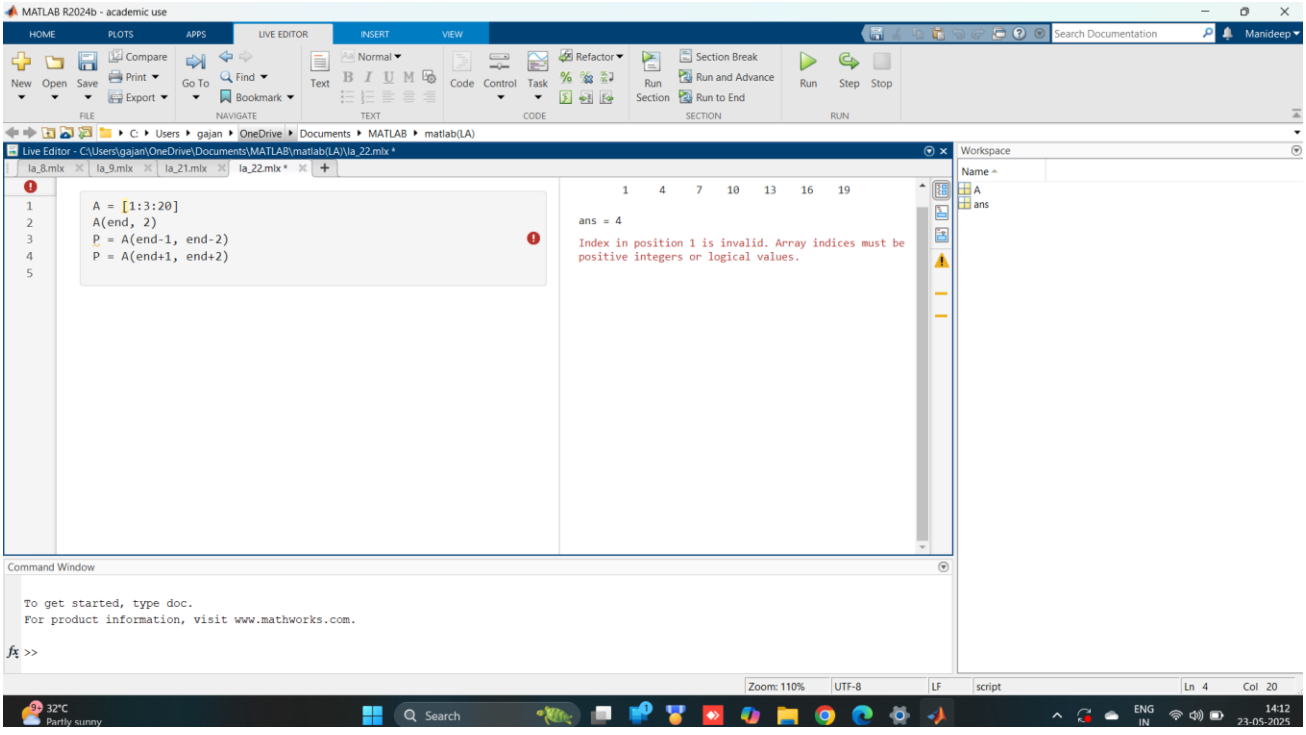

MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_17.mlx *
v1 = [3, 1, 2];
v2 = [1, 4, -1];
origin = [0, 0, 0];
[s, t] = meshgrid(-2:0.5:2);
X = s * v1(1) + t * v2(1);
Y = s * v1(2) + t * v2(2);
Z = s * v1(3) + t * v2(3);
figure;
surf(X, Y, Z, 'FaceAlpha', 0.5, 'EdgeColor', 'none');
hold on;
xlim([-10, 10]);
ylim([-10, 10]);
zlim([-10, 10]);
xlabel('x-axis');
ylabel('y-axis');
zlabel('z-axis');
title('Spanning Plane of v1 and v2');
legend('Spanning Plane', 'Vector v1', 'Vector v2');
grid on;
hold off;
Spanning Plane of v1 and v2
Spanning Plane
Vector v1
Vector v2
z-axis
y-axis
x-axis
Workspace
origin
s
t
v1
v2
x
X
y
Y
z
Z
Command Window


MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_18.mlx *
A=[1 2; 3 1];
theta=linspace(0,2*pi,100);
x=cos(theta);
y=sin(theta);
circle=[x;y];
transformed = A*circle;
figure;
subplot(1,2,1);
plot(circle(1,:),circle(2,:));
title('unit circle');
axis equal;
subplot(1,2,2);
plot(transformed(1,:),transformed(2,:));
title('transformed shape');
axis equal;
unit circle
transformed shape
Workspace
A
circle
origin
s
t
theta
transformed
v1
v2
x
X
y
Y
z
Z
Command Window


MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_19.mlx *
A = [1 0.5; -0.5 1];
square = [0 1 1 0 0; 0 0 1 1 0];
transformed = A*square;
figure;
subplot(1,2,1);
plot(square(1,:),square(2,:),'b','LineWidth',2);
title('original square');
axis equal;
grid on;
subplot(1,2,2);
plot(transformed(1,:),transformed(2,:),'r','LineWidth',2);
title('transformed shape');
axis equal;
grid on;9
original square
transformed shape
Workspace
A
circle
origin
s
square
t
theta
transformed
v1
v2
x
X
y
Y
z
Z
Command Window


MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_20.mlx *
A=[1 1; 0 1];
triangle=[0 1 0.5 0; 0 0 1 0];
transformed = A*triangle;
figure;
subplot(1,2,1);
fill(triangle(1,:),triangle(2,:),'g');
title('original triangle');
axis equal;
subplot(1,2,2);
fill(transformed(1,:),triangle(2,:),'m');
title('transformed shape');
axis equal;
clc;
clear;
original triangle
transformed shape
Workspace
Command Window


MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_21.mlx *
A = input('enter your matrix: ');
[m,n] = size(A);
if n~=m
error('matrix must be square for diagonalization');
end
[P,D] = eig(A);
eigenvalues = diag(D);
disp('eigenvalues:');
disp(eigenvalues);
disp('eigenvectors (columns of P):');
disp(P);
if rank(P) == m
disp('matrix is diagonalizable');
disp('matrix P (eigenvectors):');
disp(P);
invp = inv(P);
disp('Inverse of P:');
disp(invp);
diagonal_matrix = invp * A * P;
disp('diagonal matrix (inv(P) * A * P):');
disp(diagonal_matrix);
else
disp('matrix is NOT diagonalizable: not enough linearly independent elements');
end
eigenvalues:
-0.4641
6.4641
eigenvectors (columns of P):
-0.8069 -0.3437
0.5907 -0.9391
matrix is diagonalizable
matrix P (eigenvectors):
-0.8069 -0.3437
0.5907 -0.9391
Inverse of P:
-0.9774 0.3578
-0.6148 -0.8398
diagonal matrix (inv(P) * A * P):
-0.4641 0.0000
-0.0000 6.4641
Workspace
A
D
diagonal_mat...
eigenvalues
invp
m
n
P
Command Window
For product information, visit www.mathworks.com.
enter your matrix: A = [1 2;4 5]
enter your matrix: [1 2;4 5]
>>


MATLAB R2024b - academic use
Live Editor - C:\Users\gajan\OneDrive\Documents\MATLAB\matlab(LA)\la_22.mlx *
A = [1:3:20]
A(end, 2)
P = A(end-1, end-2)
P = A(end+1, end+2)
1 4 7 10 13 16 19
ans = 4
Index in position 1 is invalid. Array indices must be positive integers or logical values.
Workspace
A
ans
Command Window
To get started, type doc.
For product information, visit www.mathworks.com.
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