MATLAB Tutorial

1. Click "New" to add new script
2. Save it as any location you prefer

Basic Operator

|	
+	Plus; addition operator.
-	Minus; subtraction operator.
*	Scalar and matrix multiplication operator.
.*	Array multiplication operator.
^	Scalar and matrix exponentiation operator.
.^	Array exponentiation operator.
\	Left-division operator.
/	Right-division operator.
.\	Array left-division operator.
./	Array right-division operator.
:	Colon; generates regularly spaced elements and represents an entire row or column.

Exponential and Logarithmic Functions

exp(x)	Exponential; e^x.
log(x)	Natural logarithm; ln(x).
log10(x)	Common (base 10) logarithm; log(x)= $\log_{10}(x)$.
sqrt(x)	Square root; $\sqrt{x}$.

Symbolic Linear Algebra Functions

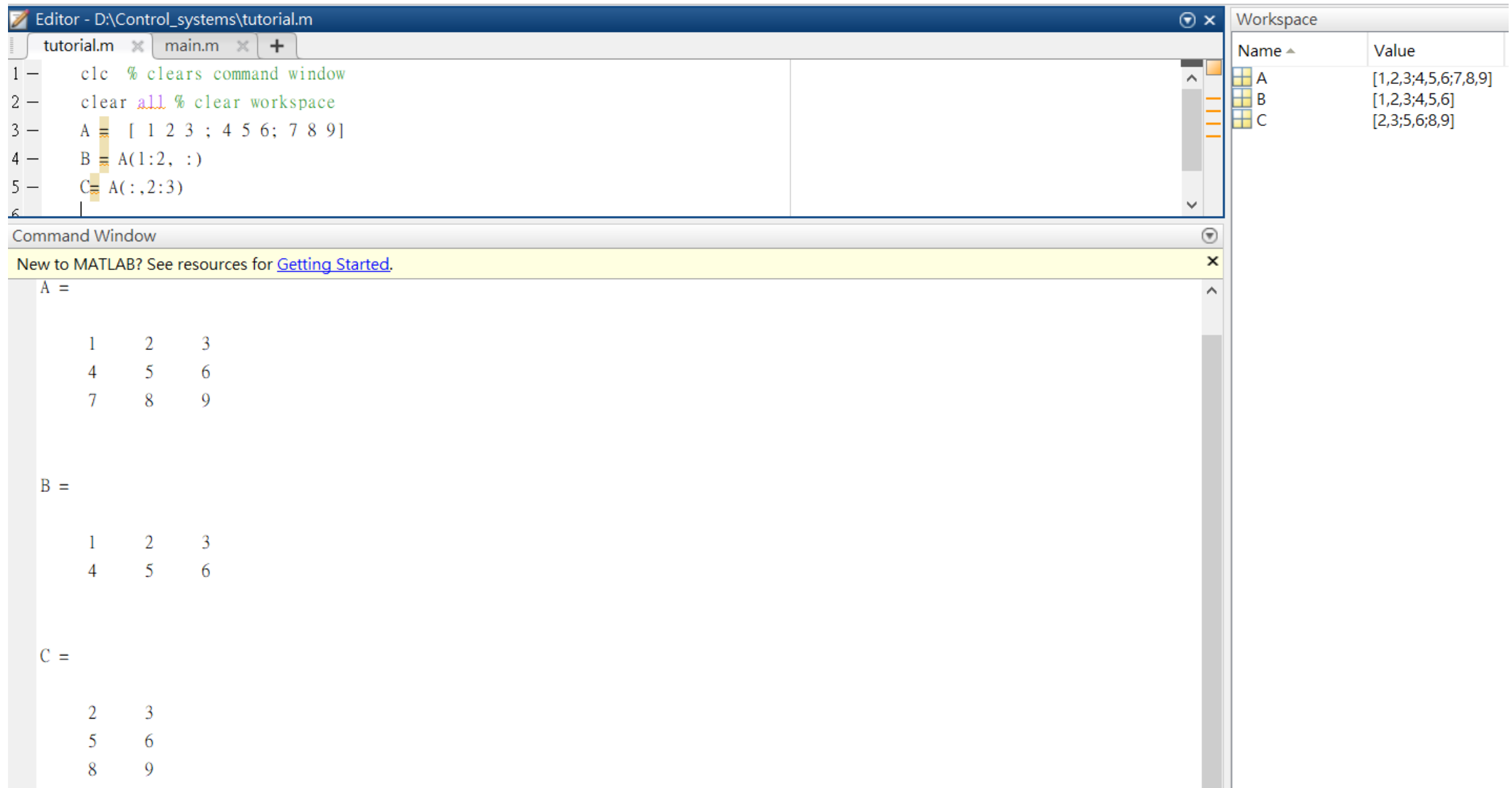|	
det	Returns the determinant of a matrix.
eig	Returns the eigenvalues (characteristic roots) of a matrix.
inv	Returns the inverse of a matrix.
poly	Returns the characteristic polynomial of a matrix.

Matrix Representation
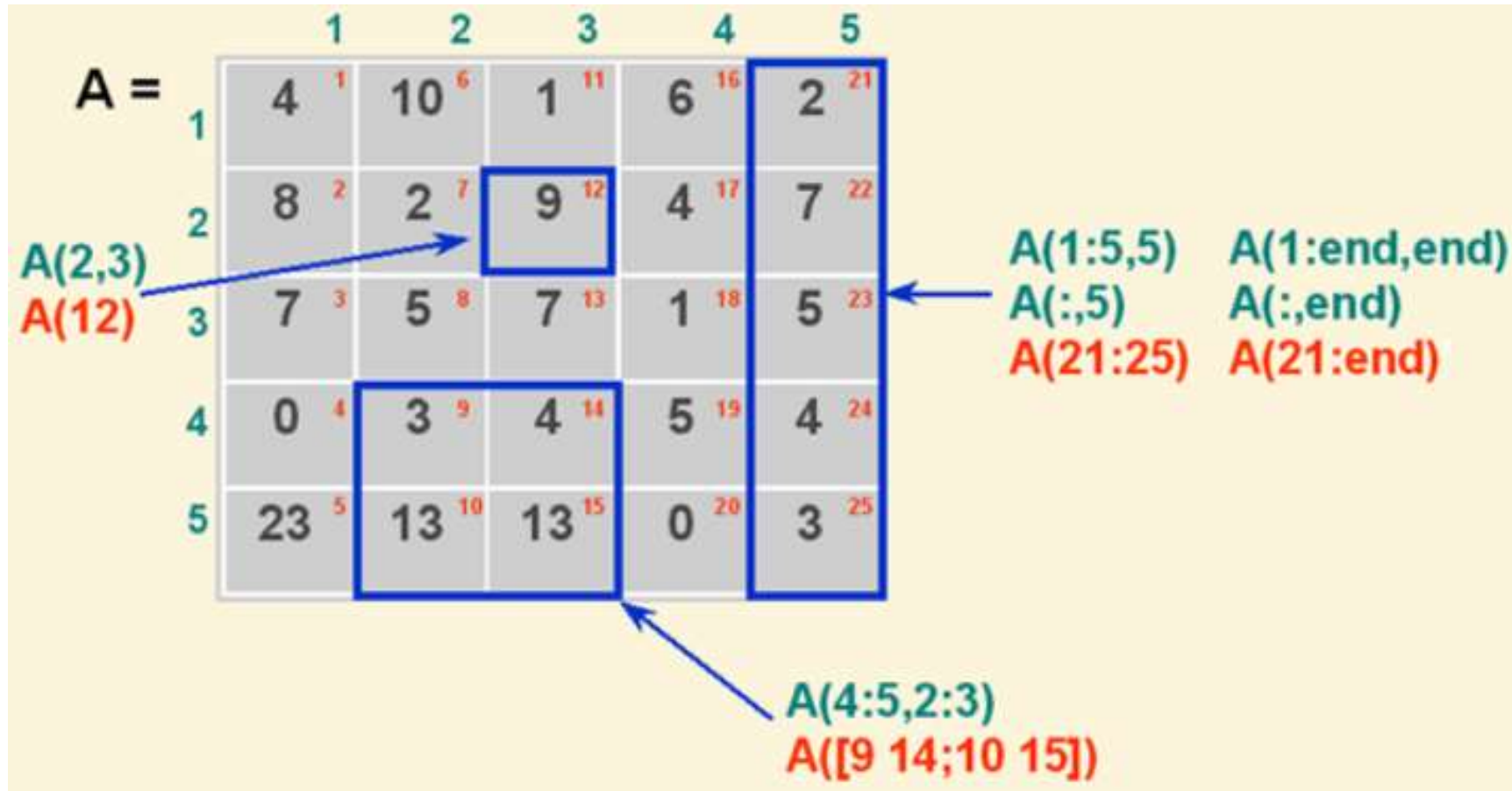
Exercise 1 – Create Matrix

```
Editor - D:\Control_systems\tutorial.m
tutorial.m ✕   main.m ✕  +

1 —     clc  % clears command window
2 —     clear all % clear workspace
3 —     A =  [ 1 2 3 ; 4 5 6; 7 8 9]
4 —     B = A(1:2, :)
5 —     C= A(:,2:3)
6
```

Workspace

Name ▲	Value
A	[1,2,3;4,5,6;7,8,9]
B	[1,2,3;4,5,6]
C	[2,3;5,6;8,9]

Command Window

New to MATLAB? See resources for Getting Started.

```
A =

     1     2     3
     4     5     6
     7     8     9


B =

     1     2     3
     4     5     6


C =

     2     3
     5     6
     8     9
```
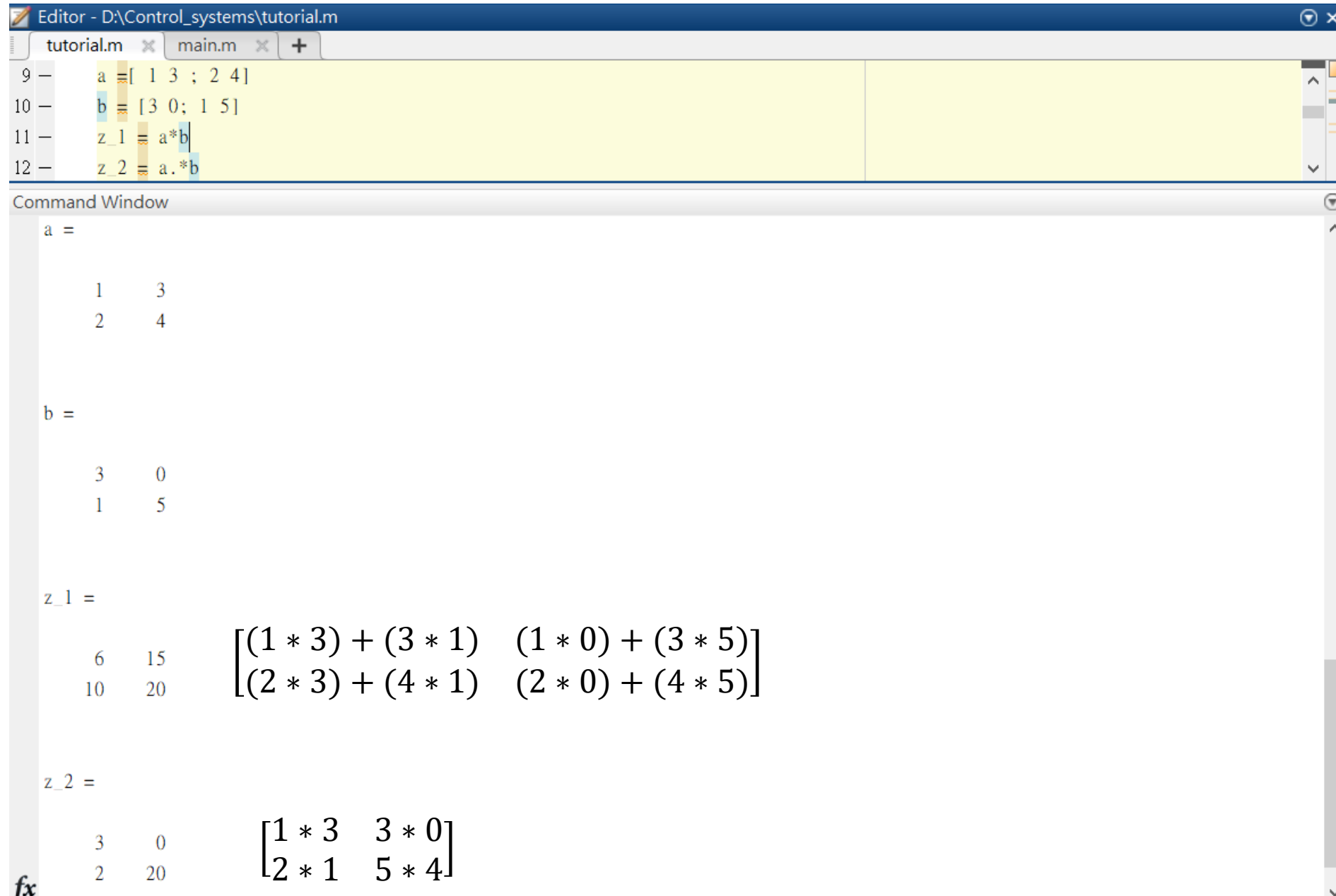
Exercise 2 – Matrix Multiplication

```
Editor - D:\Control_systems\tutorial.m                                    ⊙ ×
  tutorial.m  ×   main.m  ×   +
  9 —      a =[ 1 3 ; 2 4]
 10 —      b = [3 0; 1 5]
 11 —      z_1 = a*b
 12 —      z_2 = a.*b
```

Command Window

```
a =

     1     3
     2     4


b =

     3     0
     1     5


z_1 =

     6    15
    10    20
```

$$\begin{bmatrix} (1*3)+(3*1) & (1*0)+(3*5) \\ (2*3)+(4*1) & (2*0)+(4*5) \end{bmatrix}$$

```
z_2 =

     3     0
     2    20
```

$$\begin{bmatrix} 1*3 & 3*0 \\ 2*1 & 5*4 \end{bmatrix}$$

Exercise 3 – Solve Linear Equations

```
18          %A*X = B
19 —        y_1 = [2 4 ; 1 4]     %y_1 = 2*x_1 + 4*x_2 = 16;
20 —        y_2 = [16; 14]        %y_2 = 1*x_1 + 4*x_2 =14;
21 —        x_value =y_1 \ y_2    %You can also do inv(y_1)*y_2
22
23
```

$$y_1 = 2x_1 + 4x_2 = 16$$
$$y_2 = 1x_1 + 4x_2 = 14$$

Command Window

```
y_1 =

    2    4
    1    4
```

$$y_1 = \begin{bmatrix} 2 & 4 \\ 1 & 4 \end{bmatrix}$$

```
y_2 =

    16
    14
```

$$y_2 = \begin{bmatrix} 16 \\ 14 \end{bmatrix}$$
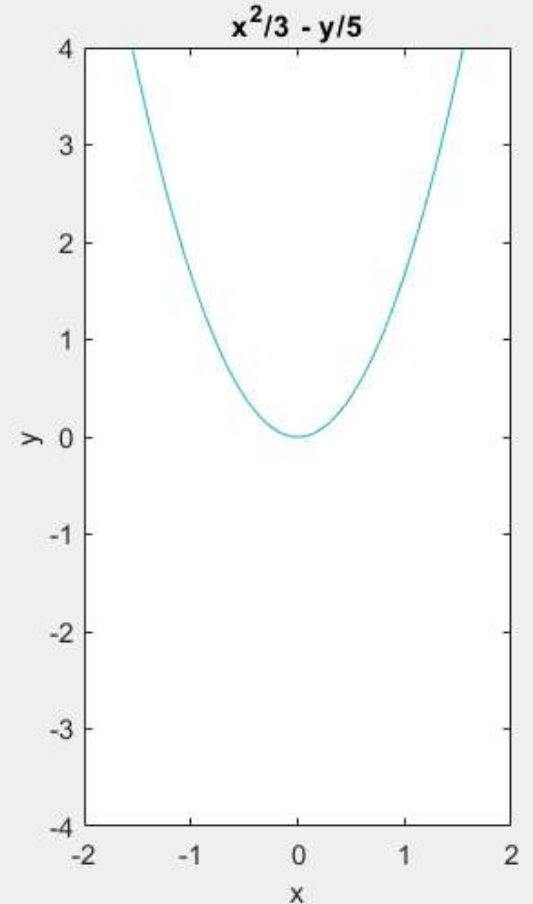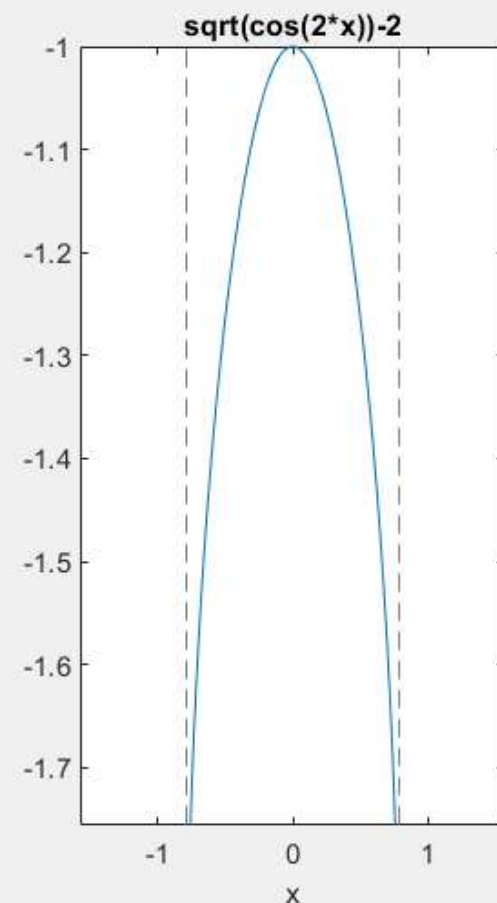
```
x_value =

    2
    3
```

$$\text{x\_value} = \begin{bmatrix} 2 \\ 3 \end{bmatrix} \Rightarrow x_1 = 2 \,, x_2 = 3$$

Exercise 4 – Plot equations

```
%%
%plot equations
subplot(1,2,1) % column:1 /row:2 /figure location: 1
fplot(@(x) sqrt(cos(2*x))-2,[-pi/2, pi/2])  %ezplot(fun2,[xymin,xymax])
title('sqrt(cos(2*x))-2');
xlabel('x');


subplot(1,2,2)  % column:1 /row:2 /figure location: 2
syms x y
ezplot((x.^2/3) - (y./5), [-2, 2, -4, 4]) %ezplot(fun,[xmin,xmax,ymin,ymax])
```

nd Window

Eq1: $\quad y = \sqrt{\cos(2x)} - 2 \,, \; x \in [-\frac{\pi}{2}, \frac{\pi}{2}]$

Eq2: $\quad f(x, y) = \frac{x^2}{3} - \frac{y}{5} \,, \; (-2 \le x \le 2, -4 \le y \le 4)$

File Edit View Insert Tools Desktop Window Help

Reference

- https://www.tutorialspoint.com/matlab/index.htm