National University of Sciences and Technology (NUST)
School of Electrical Engineering and Computer Science

Department of Electrical Engineering and Computer Science

Faculty Member: Dr. Salman Ghafoor Dated: 19/09/2022

Semester: 5th Section: BEE 12C

EE-232: Signals and Systems

Lab 2: Plotting and Array processing in MATLAB

Group Members

		PLO4 – CLO3	PLO5 - CLO3	PLO8 - CLO4	PLO9 - CLO4
Name	Reg. No	**Viva / Quiz / Lab Performance**	**Analysis of data in Lab Report**	**Modern Tool Usage**	**Ethics and Safety**
		5 Marks	**5 Marks**	**5 Marks**	**5 Marks**
Danial Ahmad	331388				
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1 Table of Contents

2 Introduction to MATLAB

2.1 Objectives

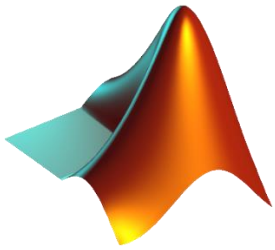
This Lab experiment has been designed to familiarize students with operations on arrays in MATLAB, plotting elementary functions, as well as manipulating plotting interface.

- Familiarization with array specific operators in MATLAB
- How to plot with different styles
- How to handle matrices and vectors in MATLAB

2.2 Equipment

Software

- *MATLAB*



2.3 Lab Instructions

All questions should be answered precisely to get maximum credit. Lab report must ensure following items:

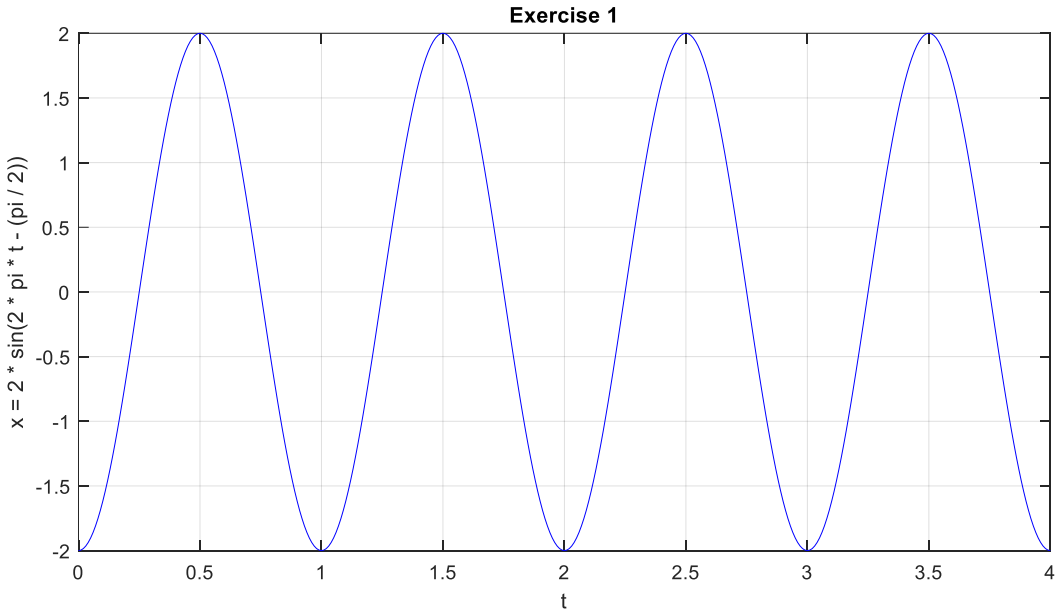
- Lab objectives
- MATLAB codes
- Results (Graphs/Tables) duly commented and discussed
- Conclusion

3 Exercise

3.1 Task 1

Draw **x(t) = 2 sin (2πt - π/2)** for $0 \leq t \leq 4$.

```
function exercise_1()
    t = 0:0.01:4;
    x = 2 * sin(2 * pi * t - (pi / 2));
    plot(t, x, '-r');
    grid
    title('Exercise 1')
    xlabel('t')
    ylabel('x = 2 * sin(2 * pi * t - (pi / 2))')
end
```

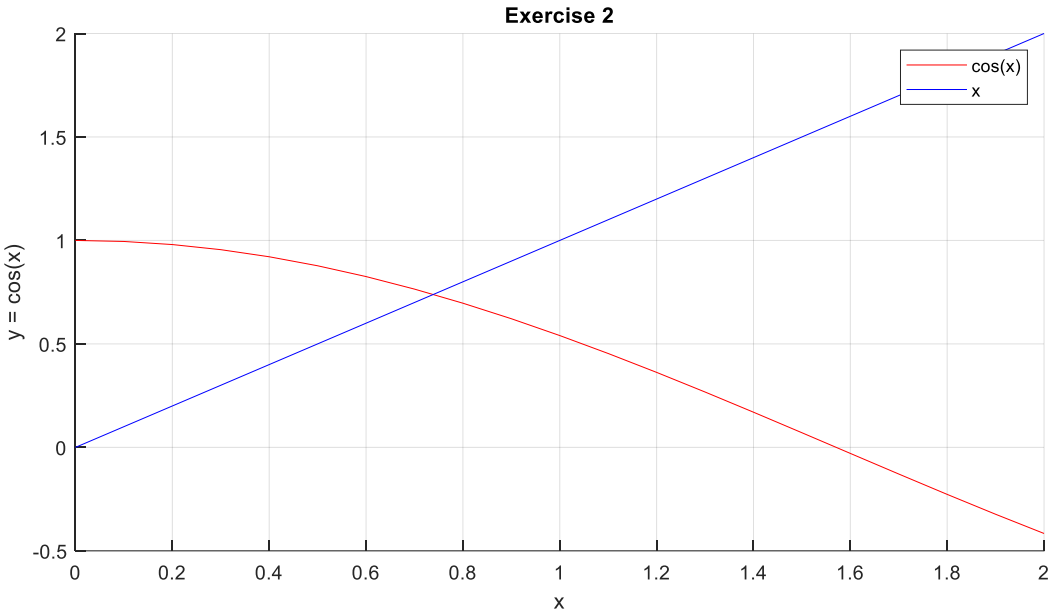


3.2 Task 2

Draw graphs of the functions; **[y = cos(x), y = x]**
for $0 \leq x \leq 2$ in the same window. Use the zoom facility to determine the point of intersection of the two curves (and, hence, the root of x = cos(x)) to two significant figures.

```
function exercise_2()
    x = 0:0.001:2;
    y = cos(x);
    hold
    plot(x, y, '-r');
    y = x;
    plot(x, y, '-b');
```

```
    grid
    title('Exercise 2')
    xlabel('x')
    ylabel('y = cos(x)')
    legend('cos(x)', 'x');
end
```



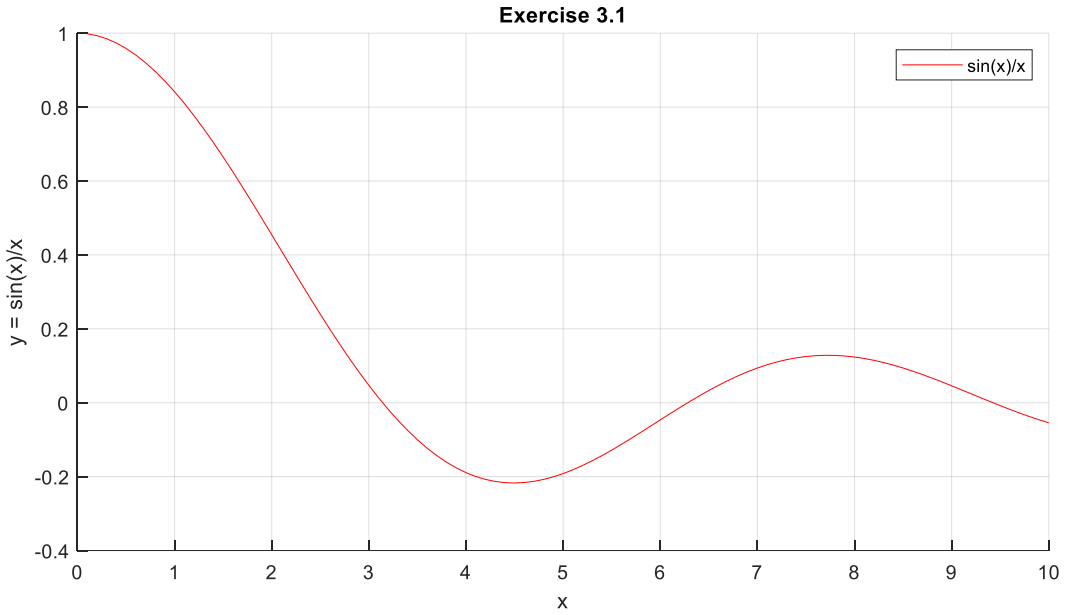
Intersection: Zooming to a suitable level, we find the intersection of the two curves to be **0.7391**, which rounded to two significant figures is **0.74**.

3.3 Task 3

Draw graphs of the functions for x =0:0.1:10 and label your graph properly.

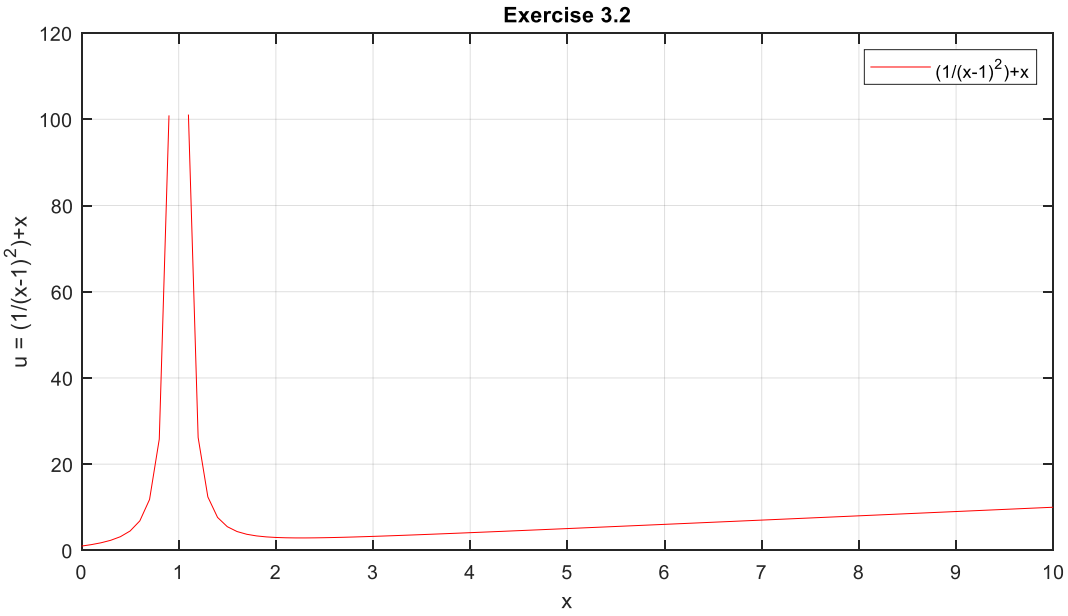
3.3.1 y = sin(x)/x

```
function exercise_3()
    x = 0:0.1:10;
    y = sin(x) ./ x;
    hold
    plot(x, y, '-r');
    grid
    title('Exercise 3.1')
    xlabel('x')
    ylabel('y = sin(x)/x')
    legend('sin(x)/x');
end
```



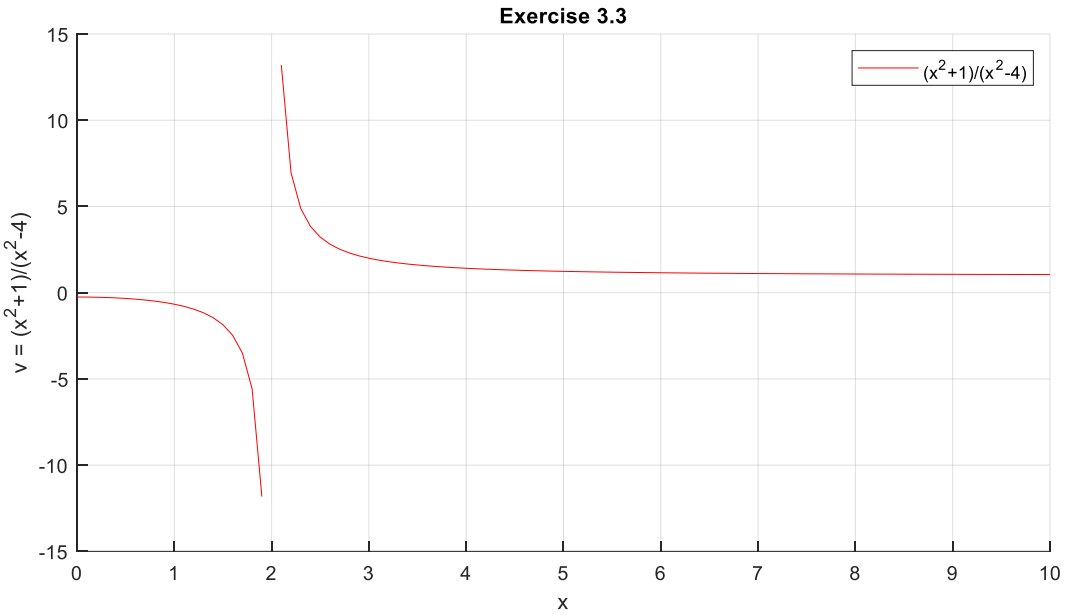
3.3.2 $u = (1/(x-1)^2)+x$

```
function exercise_3()
    x = 0:0.1:10;
    u = (1 ./ (x - 1).^2) + x;
    hold
    plot(x, u, '-r');
    grid
    title('Exercise 3.2')
    xlabel('x')
    ylabel('u = (1/(x-1)^{2})+x')
    legend('(1/(x-1)^{2})+x');
end
```



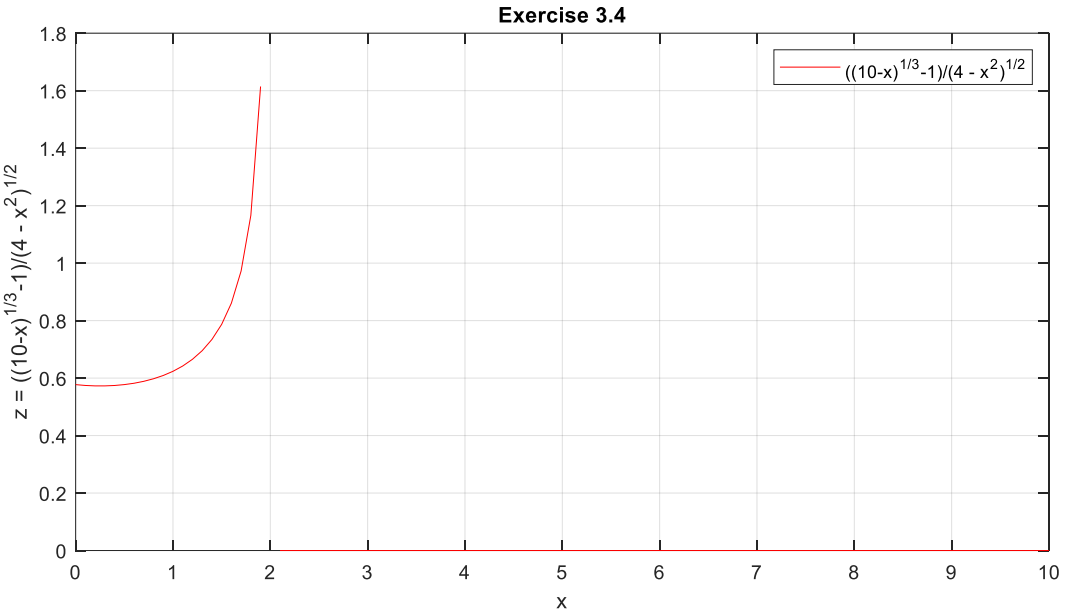
3.3.3 $v = (x^2+1)/(x^2-4)$

```
function exercise_3()
    x = 0:0.1:10;
    v = ((x.^2) + 1) ./ ((x.^2) - 4);
    hold
    plot(x, v, '-r');
    grid
    title('Exercise 3.3')
    xlabel('x')
    ylabel('v = (x^{2}+1)/(x^{2}-4)')
    legend('(x^{2}+1)/(x^{2}-4)');
end
```



3.3.4 $z = ((10-x)^{1/3}-1)/(4 - x^2)^{1/2}$

```
function exercise_3()
    x = 0:0.1:10;
    z = (((10 - x).^(1/3)) - 1) ./ (4 - (x.^2)).^(1/2);
    hold
    plot(x, z, '-r');
    grid
    title('Exercise 3.4')
    xlabel('x')
    ylabel('z = ((10-x)^{1/3}-1)/(4 - x^{2})^{1/2}')
    legend('((10-x)^{1/3}-1)/(4 - x^{2})^{1/2}');
end
```



4 Conclusion

In this lab, we further extended our knowledge of MATLAB and learned array-specific operations. We familiarized ourselves with the syntax of the plot() function; how to add more traces on a same plot window, subplots, etc. We also familiarized ourselves with element wise operations, without which MATLAB will throw an error, as elements of a mat-array are immutable otherwise.