Computer II (MATLAB)

الحاسوب 2

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Lecture 8

by

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MATLAB®

Introduction to MATLAB Plotting

- MATLAB provides extensive facilities for displaying vectors and matrices as graphs.
- Important functions include plot, xlabel, ylabel, title, and legend.
- Example Applications: Signal processing, data visualization, and engineering design.

Types of MATLAB Plots

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There are various functions that you can use to plot data in MATLAB®. This table classifies and illustrates the common graphics functions.

Line Plots	Scatter and Bubble Charts	Data Distribution Plots	Discrete Data Plots	Geographic Plots	Polar Plots	Contour Plots	Vector Fields	Surface and Mesh Plots	Volume Visualization	Animation	Images
plot	scatter	histogram	bar	geoplot	polarplot	contour	quiver	surf	streamline	animatedline	image
plot3	scatter3	histogram2	barh	geoscatter	polarhistogram	contourf	quiver3	surfc	streamslice	comet	imagesc
stairs	bubblechart	scatterhistogram	bar3	geobubble	polarscatter	contour3	feather	surfl	streamparticles	comet3	
errorbar	bubblechart3	boxchart	bar3h		polarbubblechart	contourslice		ribbon	streamribbon		
area	swarmchart	swarmchart	pareto		compassplot	fcontour		pcolor	streamtube		
stackedplot	swarmchart3	swarmchart3	stem		fpolarplot			fsurf	coneplot		
loglog	spy	piechart	stem3					fimplicit3	slice		
semilogx		donutchart	stairs					mesh			
semilogy		wordcloud						meshc			
fplot		bubblecloud						meshz			
fplot3		heatmap						waterfall			
fimplicit		parallelplot						fmesh			
		plotmatrix									

Related Topics

- Create 2-D Line Plot
- MATLAB Plot Gallery

Link: https://uk.mathworks.com/help/matlab/creating_plots/types-of-matlab-plots.html

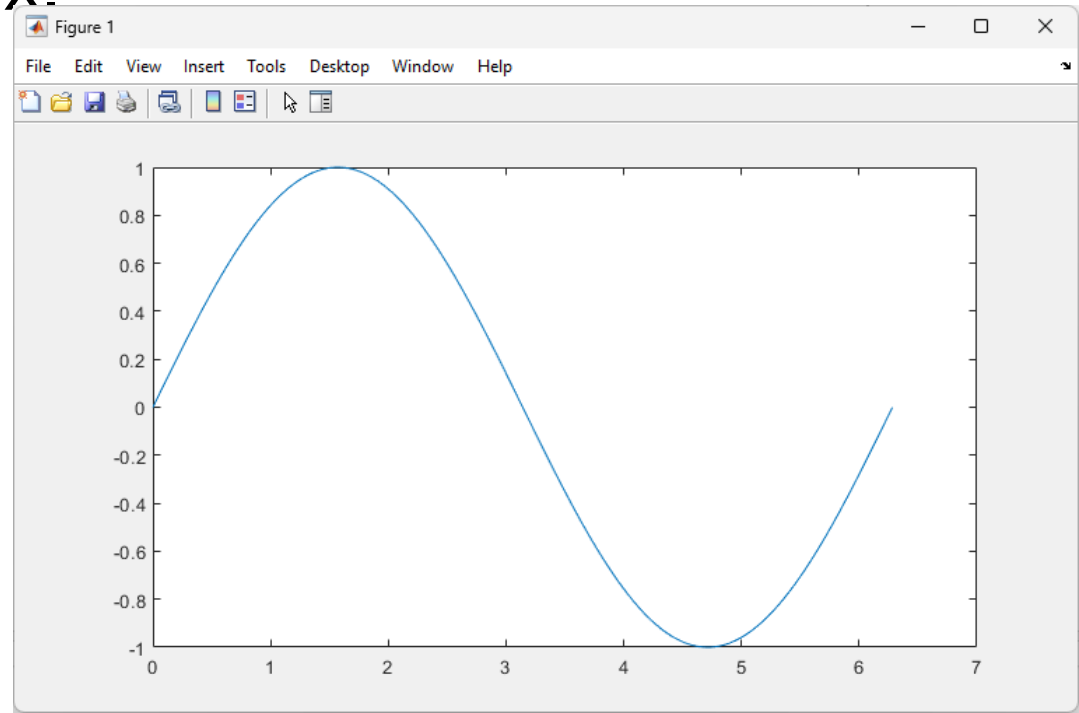
MATLAB®

Creating a Basic Plot

- Create a Plot
  - plot(y): Creates a piecewise linear graph of vector y vs. its index.
  - plot(x, y): Creates a graph of y vs. x.

- Example:

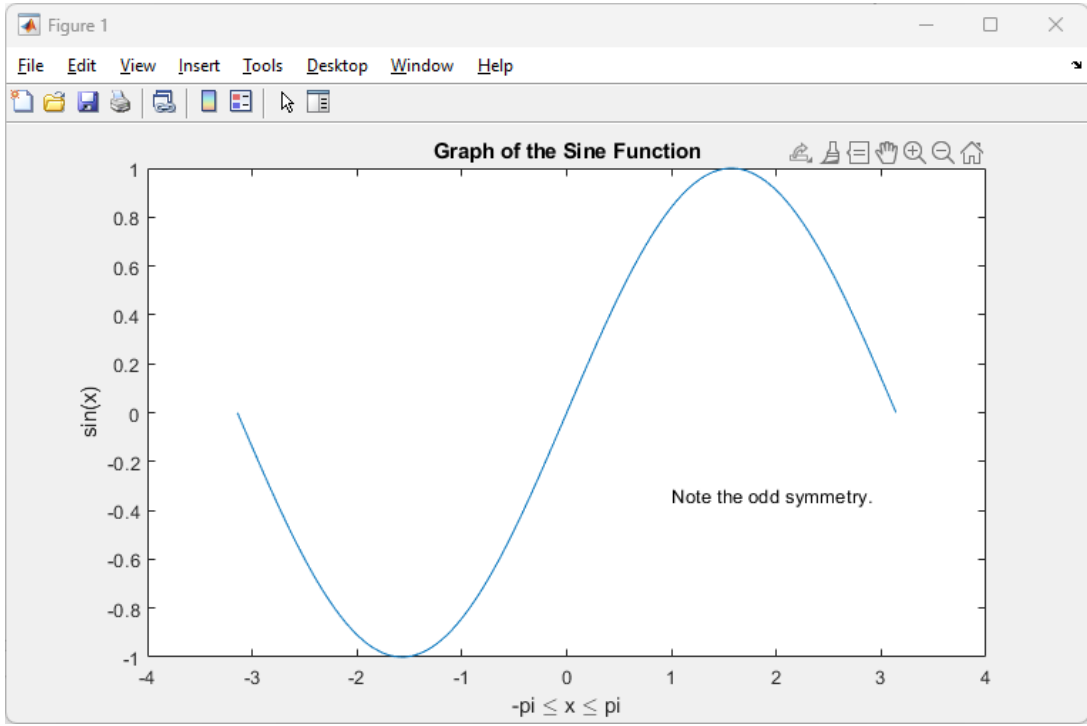
```
x = 0:pi/100:2*pi;
y = sin(x);
plot(x, y);
```



Axis Labels and Titles

- Tools:
  - xlabel, ylabel, zlabel: Add labels to the x, y, and z axes.
  - title: Adds a title to the plot.
  - text: Inserts text anywhere in the figure.
- Example:

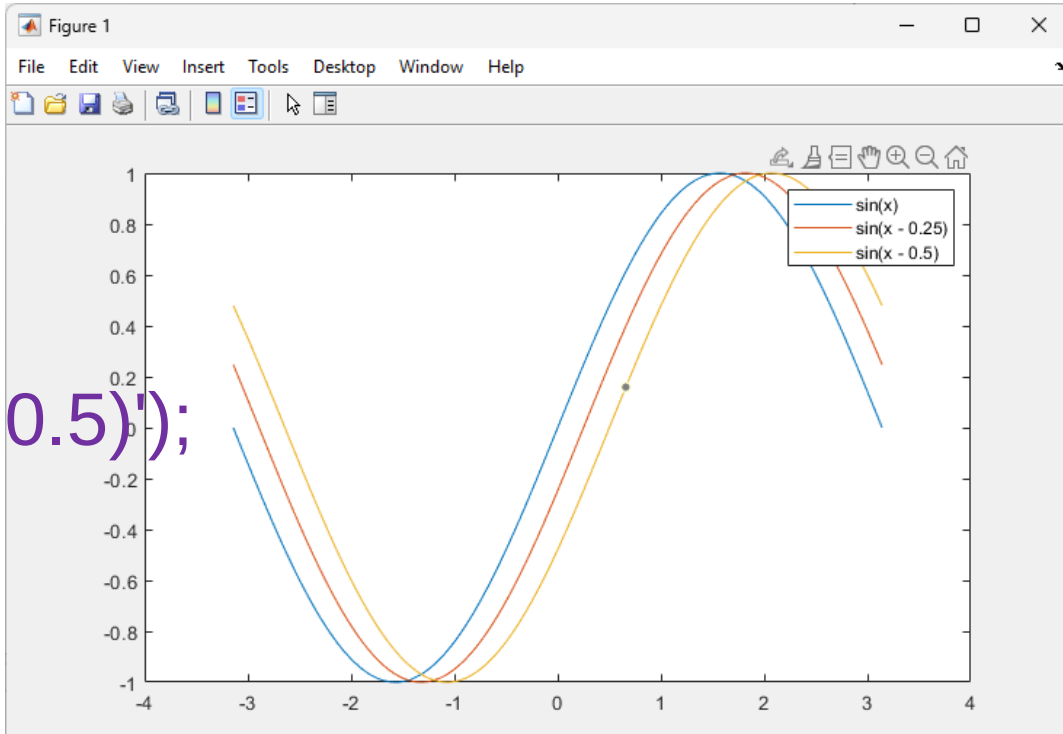
```
x = -pi:pi/100:pi;
y = sin(x);
plot(x, y);
xlabel('-pi \leq x \leq pi');
ylabel('sin(x)');
title('Graph of the Sine Function');
text(1, -1/3, 'Note the odd symmetry.');
```



Multiple Data Sets in One Graph

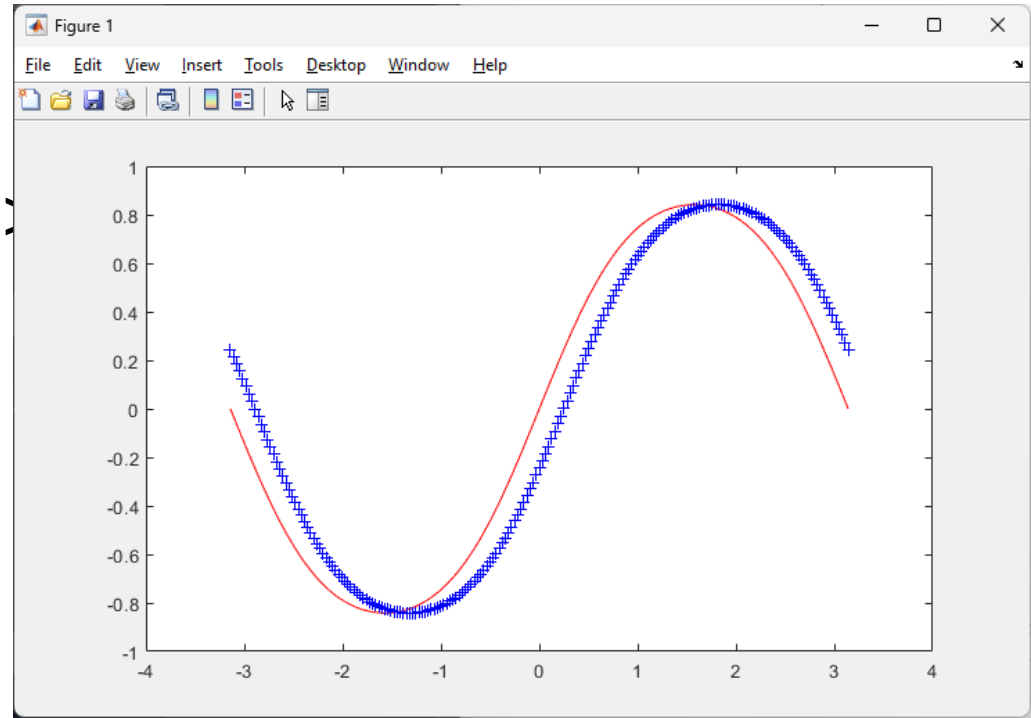
- Plotting Multiple Curves:
  - Use multiple x-y pairs in the plot function.
  - MATLAB automatically cycles through colours.
- Example:

```
y2 = sin(x - 0.25);
y3 = sin(x - 0.5);
plot(x, y, x, y2, x, y3);
legend('sin(x)', 'sin(x - 0.25)', 'sin(x - 0.5)');
```



Specifying Line Styles and Colors

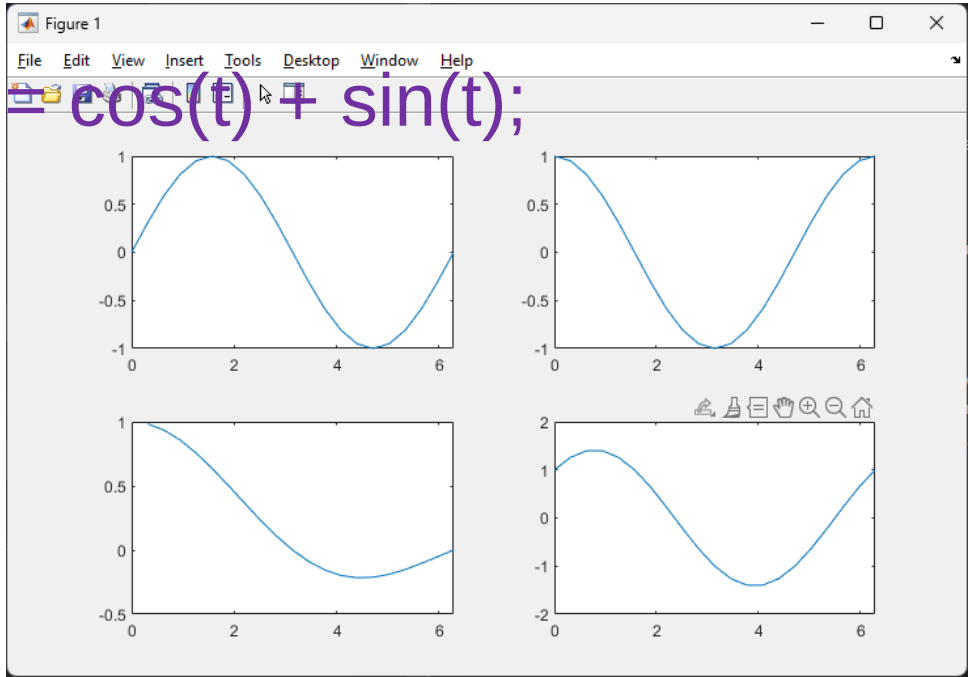
- Syntax:
  - plot(x, y, 'color_style_marker’);
- Options:
  - Colors: 'c', 'm', 'y', 'r', 'g', 'b', 'w', 'k'.
  - Line Styles: '-', '--', ':', '-.'.
  - Markers: '+', 'o', '*', 'x', 's', 'd', '^', 'v', '>
- Example:
  - plot(x, sin(y), ‘r-’, x, sin(y2), 'r+');



Multiple Plots in One Figure

- Using subplot:
  - subplot(m, n, p): Divides the figure into an **m-by-n** grid and selects the **p** subplot.
- Example:

```
t = 0:pi/10:2*pi;
y1 = sin(t); y2 = cos(t); y3 = sin(t)./t; y4 = cos(t) + sin(t);
subplot(2, 2, 1); plot(t, y1);
subplot(2, 2, 2); plot(t, y2);
subplot(2, 2, 3); plot(t, y3);
subplot(2, 2, 4); plot(t, y4);
```



Setting Axis Limits

- Syntax:
  - axis([xmin xmax ymin ymax]);
- Example:

  axis([-pi pi -1 1]);

Summary

- Key Points:
  - Basic plotting in MATLAB using plot, xlabel, ylabel, title.
  - Plotting multiple datasets and customizing line styles and colors.
  - Using subplot for multiple plots in one figure.