Matlab Tutorial
Figures, Plots & Graphs

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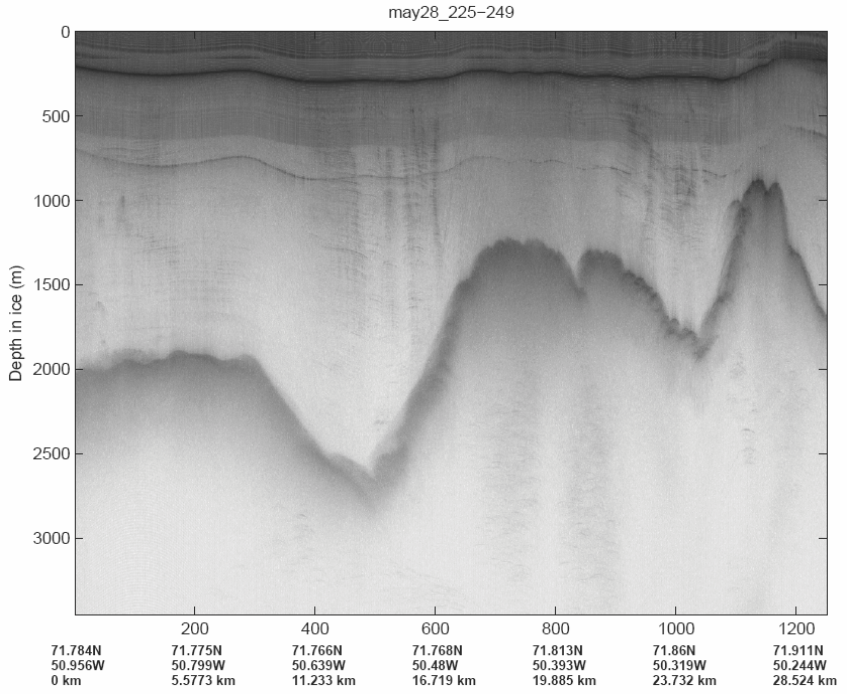
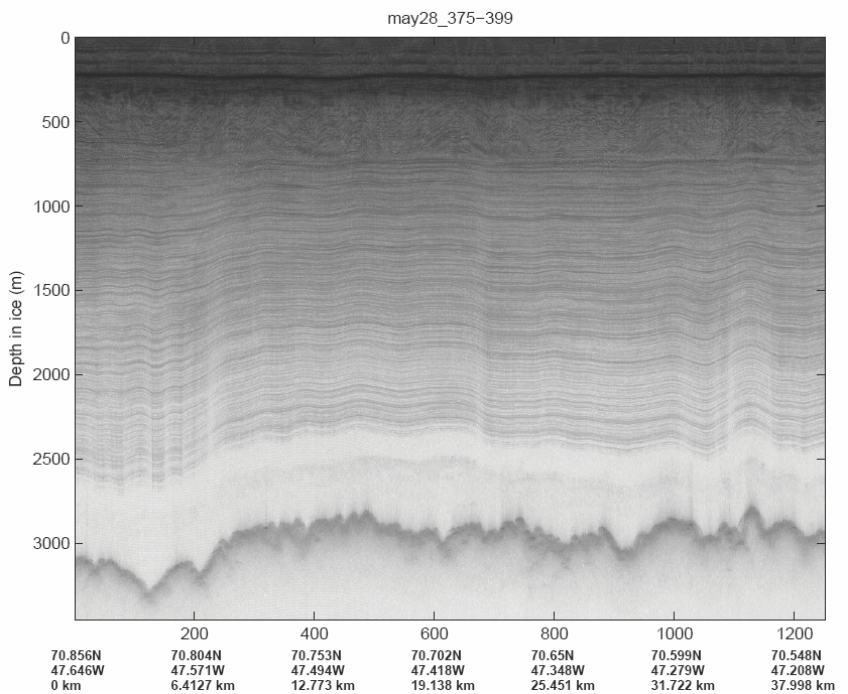
Outline

- Introduction
- Scalar, Vector and Matrix
- Math operators in plots and graphs
- Types of Plots available in Matlab
- Examples: Stem command & SAR
- Matlab demo window for graphs
- Questions?

Introduction

Example: Jakobshavn Preliminary data (May 2006, CReSIS (MCRS)





Introduction (2/2)

Matlab features can be used for:

- A visual interface between numbers, vectors, matrices (data)
- Plotting correlations between inputs
- Digital Signal and Image processing
- Surface (area) contour
- Frequency spectrum visualization
- Simulation of communications systems
- Etc.

Scalar, Vector and Matrix Concept Review

- **Scalar:** Vector 1x1 element
  - A scalar will be plotted as a single dot? True or False?
- **Vector:** Scalar or a collection of them in an array by 1xn or mx1 elements, where n, m are integers.
  - A vector will be plotted as a single dot? Right?
- **Matrix:** A collection of vectors. *For convention, a matrix is denoted with capital letters.*
  - *What will a plot of a matrix look like?*

Scalar, Vector and Matrix (2/3)

- **Why ‘ “: ; ([“ ‘are important???**
  - Plot commands require vector or matrix dimensions agree. (Debug!!)

- ***Watch colon, semicolon and bracket notation when you perform a vector or matrix!***

- **Colon:** can be use for producing row vectors:
  - >> a=1:4 gives the vector a=1 2 3 4

Scalar, Vector and Matrix (3/3)

- **Bracket:** used to denote a vector with certain elements:
  - >> b=[1 4] gives the vector b = 1 4
  - >> c=[1:4] gives the vector c = 1 2 3 4

- **Semicolon:** used to separate rows or columns
  - >> d=[1;4] gives the vector d = 1
    4
- Don't know how to use them?
  - Type "help\matlab\elmat"

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Math operators in plots & graphs

- Dot operator '.'
  - Matlab performs an element-by-element operation
  - Example: C = A ./ B is the matrix with elements c(i,j) = a(i,j)/b(i,j)
- Should I watch the dot operator if I want to perform a multiplication, division, summation or subtraction? Yes, no? Why?

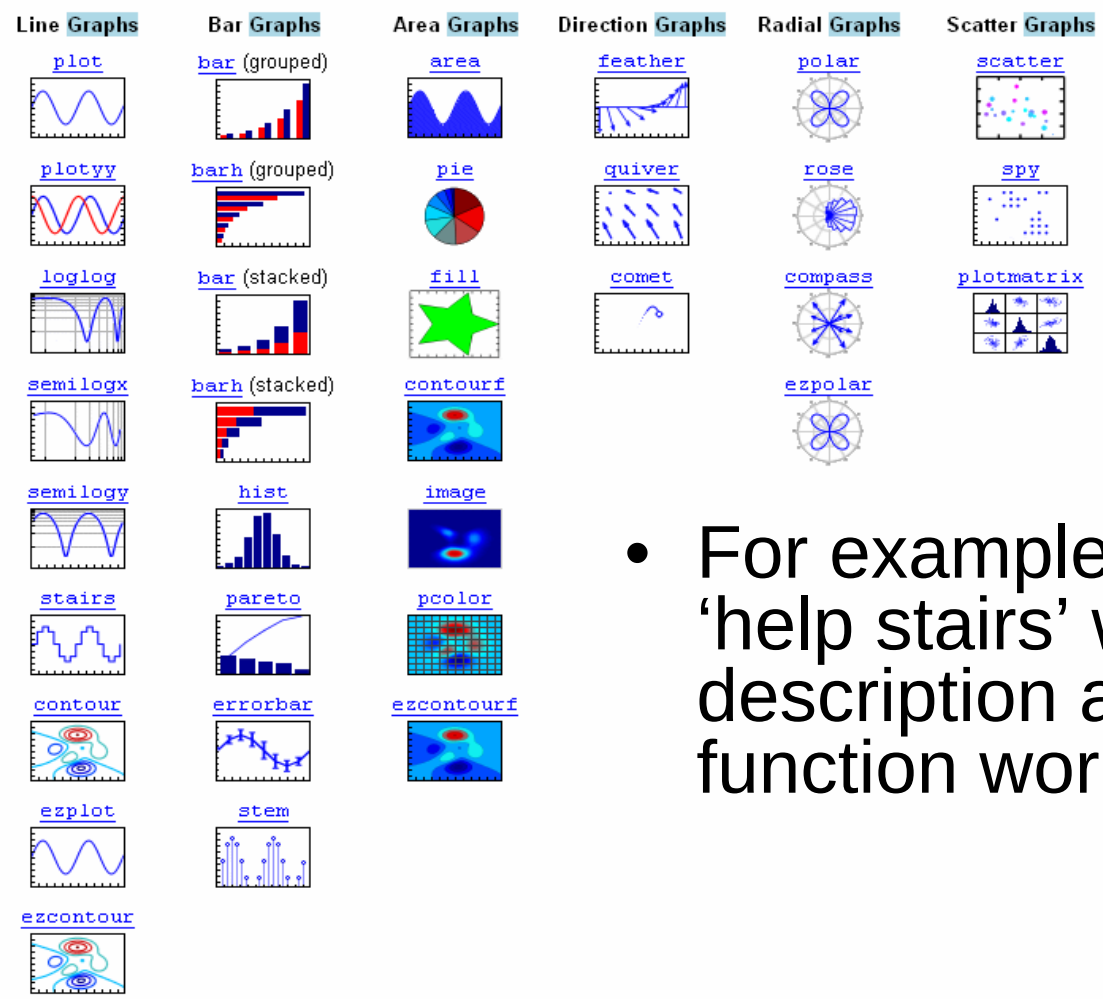
Types of Plots available in Matlab

Matlab can construct a wide variety of 2D & 3D plots without any programming required on your part.

Some of the 2-D plotting functions are

- plot : Create a linear graph
- loglog : Create a logarithmic graph
- semilogx : Create a semi-log scale plot
- polar : Create a Polar coordinate plot
- subplot : Create plots in tiled positions

Types of Plots available in Matlab(2/5)



- For example, by typing ‘help stairs’ we can get a description about how this function works.

Types of Plots available in Matlab (3/5)

Some of the 3-D plotting functions are

- plot3 : Create plot lines in 3-D space
- mesh : Create a 3-D mesh surface
- surf : Create a 3-D colored surface
- fill3 : Create a filled 3-D polygons

Types of Plots available in Matlab (4/5)

- Again, for example, by typing ‘help mesh’ we can access the help menu with a description of how this function works.

Types of Plots available in Matlab (5/5)

Graph notation

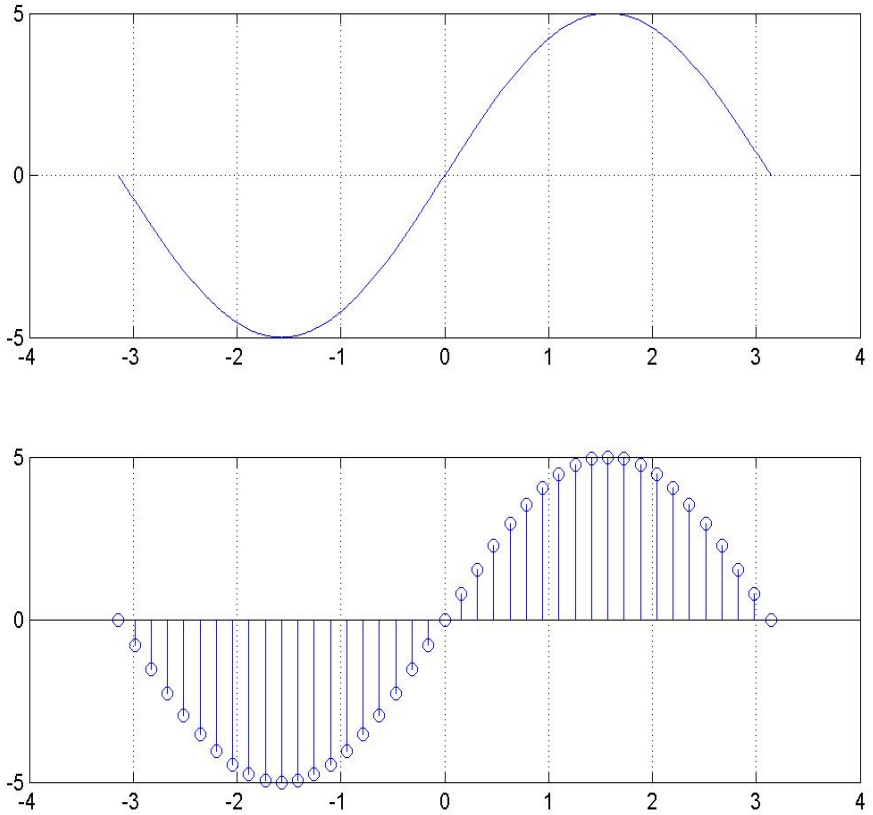
- title : Label the graph title
- xlabel : Label the x axis
- gtext : Place text where the mouse is located

Example: Stem command

- Matlab assumes continuous signal (sequence)
- What about if I want to plot a discrete sequence?
  - stem(x,y)
- Example: Sine function…..

Example: Stem command (2/4)

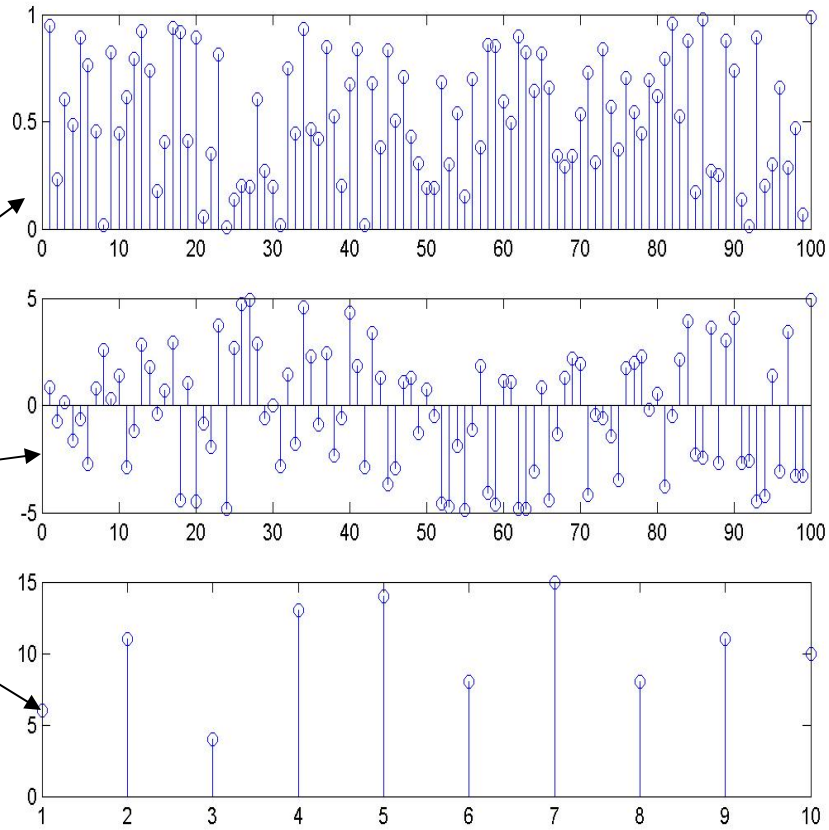
```
clear all;
clg;
clc;
x1=-pi:pi/180:pi;
x2=-pi:pi/20:pi;
b1=5*sin(x1);
b2=5*sin(x2);
subplot(2,1,1),plot(x1,b1),grid on
subplot(2,1,2),stem(x2,b2),grid on
```



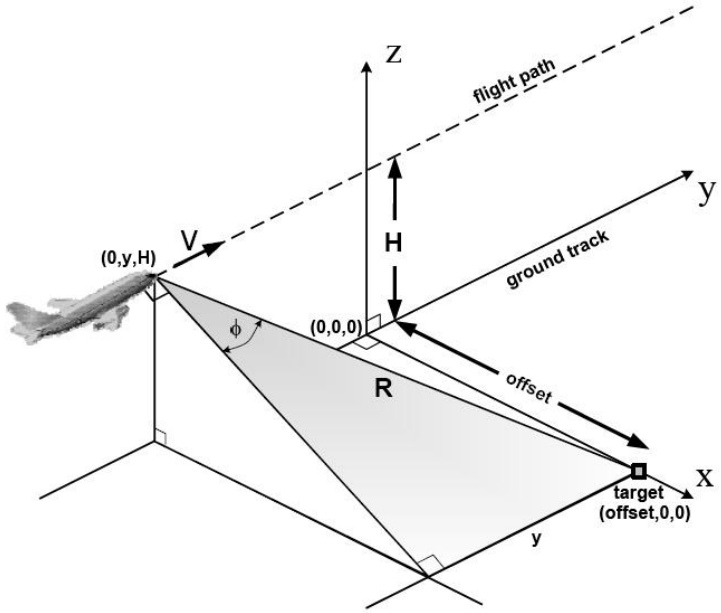
Example: Stem command (3/4)

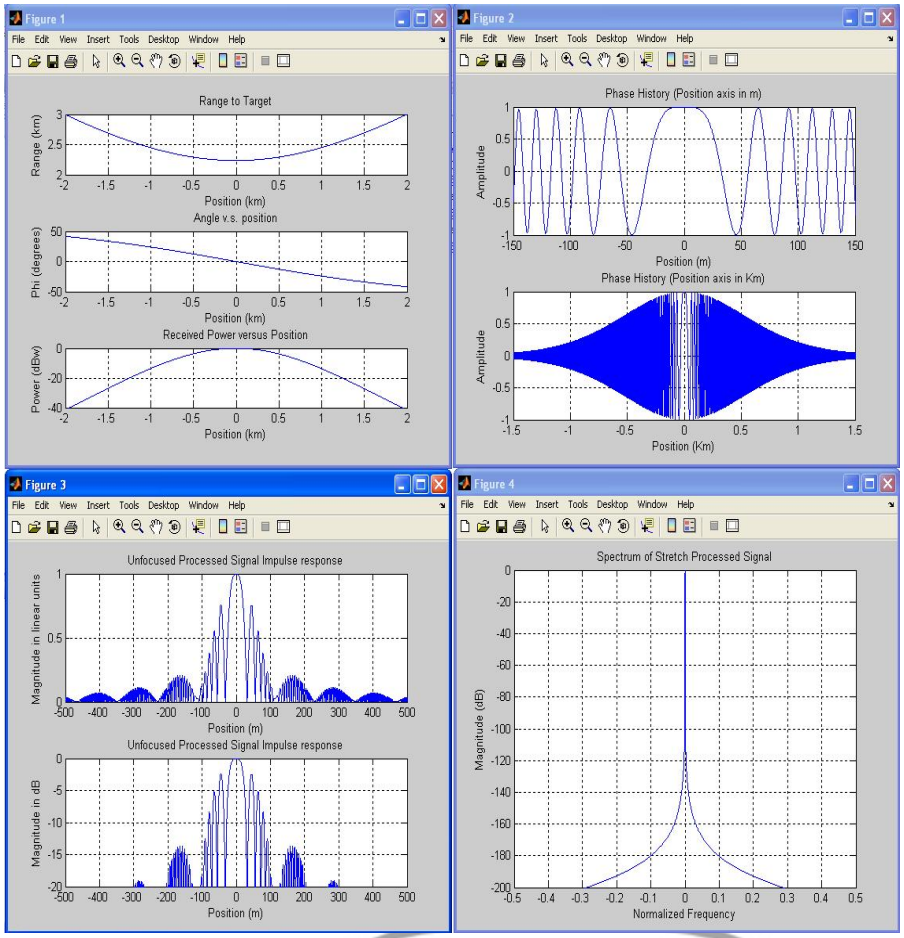
Random sequence

```
clear all;clg;clc
subplot(3,1,1);stem(rand(100,1))
subplot(3,1,2);stem(10*rand(100,1)-5)
subplot(3,1,3);stem(hist(10*rand(100,1)-5))
```



Example: Chirp waveform used for pulse compression (4/4)





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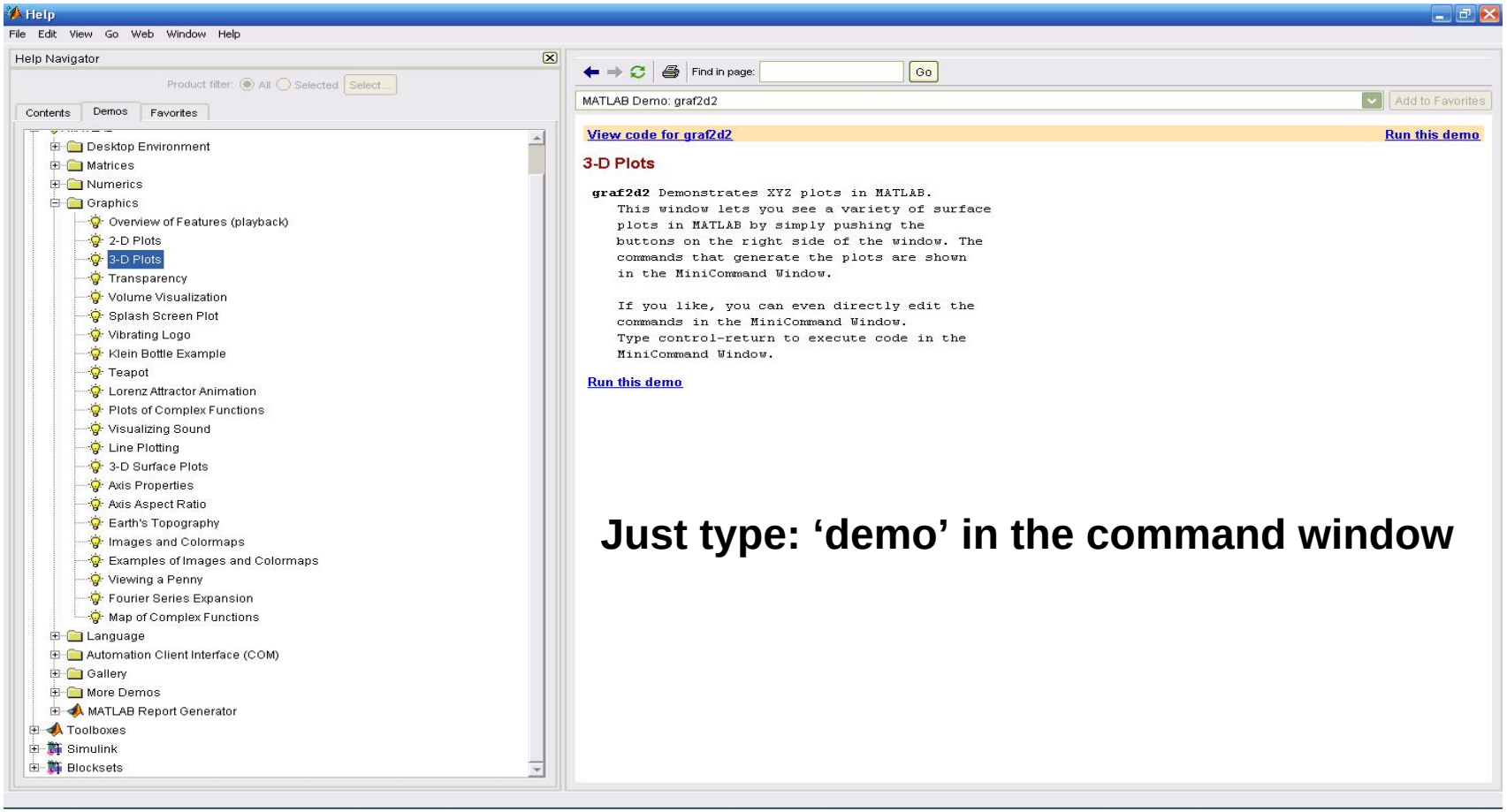
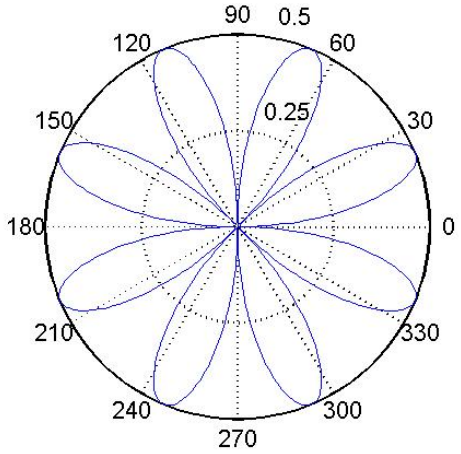
Matlab demo window for graphs



Just type: ‘demo’ in the command window

Matlab demo window for graphs (2/4)

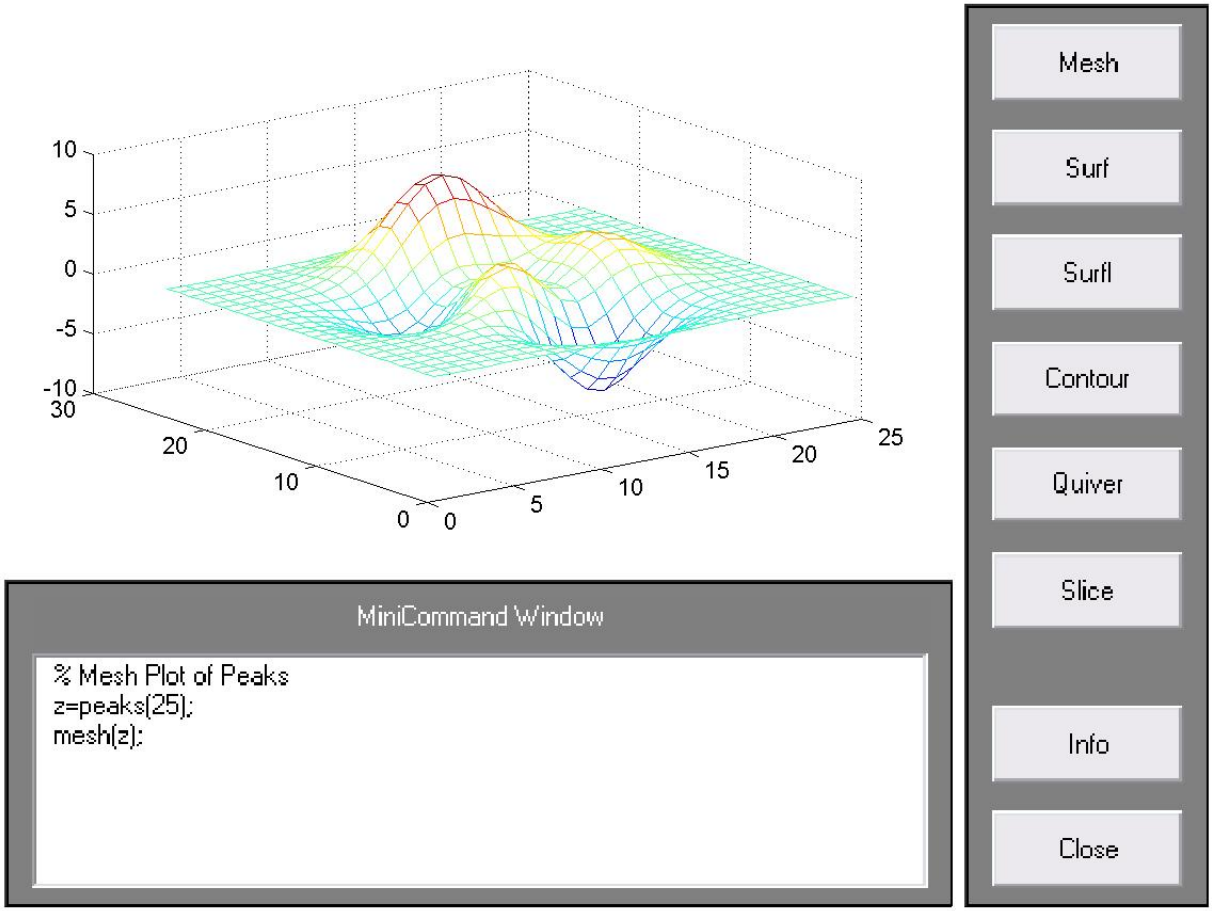


Line
Bar
Stair
Error Bar
Polar
Stem
Info
Close

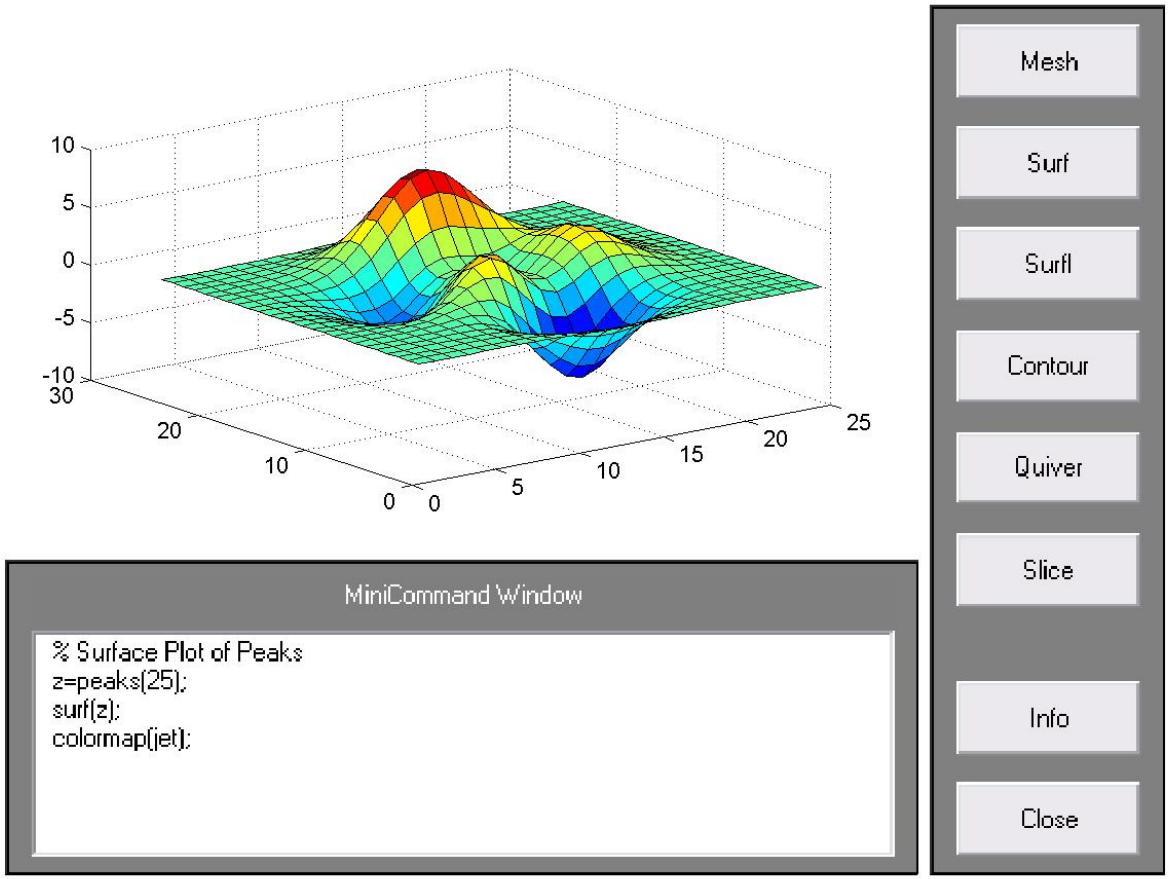
MiniCommand Window

```
% Polar plot
t=0:.01:2*pi;
polar(t,abs(sin(2*t).*cos(2*t)));
```

Matlab demo window for graphs (3/4)



Matlab demo window for graphs (4/4)



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WHERE DISCOVERIES BEGIN

Questions?

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