MONASH University

MONASH
ENGINEERING
ENG1060

PLOTTING MULTIPLE DATA SETS

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GROUP OF EIGHT AUSTRALIA

THE PLOT FUNCTION

- Syntax: plot(x, y)

- Multiple plots can be drawn in the same figure

  Syntax: plot(x1, y1, x2, y2, x3, y3)

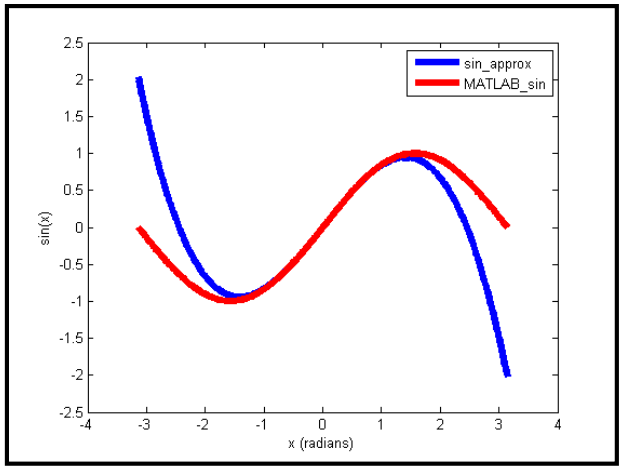
- More complementary functions:

  legend('string')

  hold on/off

  grid on/off

  figure



MORE BUILT-IN FUNCTIONS

- figure: Creating a new figure window
- close all: Closing all opened figure windows
- hold on: To hold (not overwrite) the current figure window (also hold off)
- grid on: Turn on grid axes (also grid off)
- legend: Turn on a legend with a key
- subplot(rows, columns, index): Multiple plot windows in a figure window
- axis([xmin xmax ymin ymax]): Setting range of x and y axes:

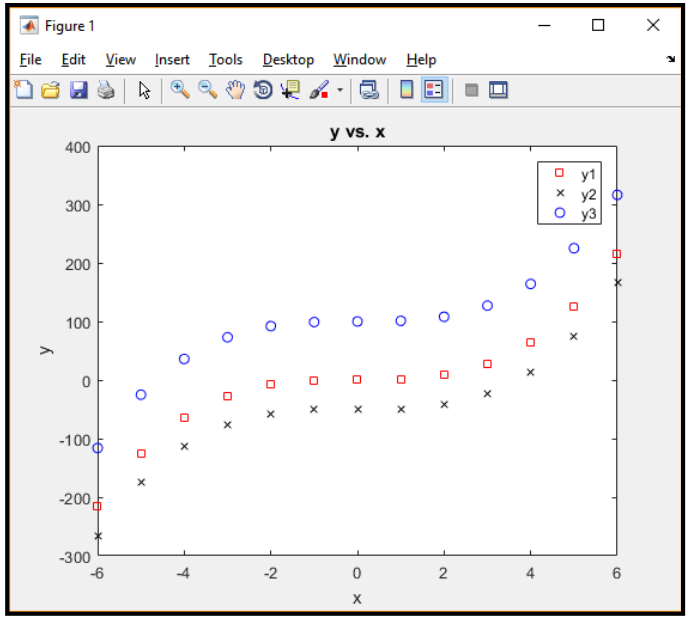
HOLD ON, THERE'S MORE PLOTTING

- Example:

```
plot(x,y1,'rs',x,y2,'kx',x,y3,'bo')
xlabel('x')
ylabel('y')
title('y vs. x')
legend('y1','y2','y3')
```

- Equivalent code:

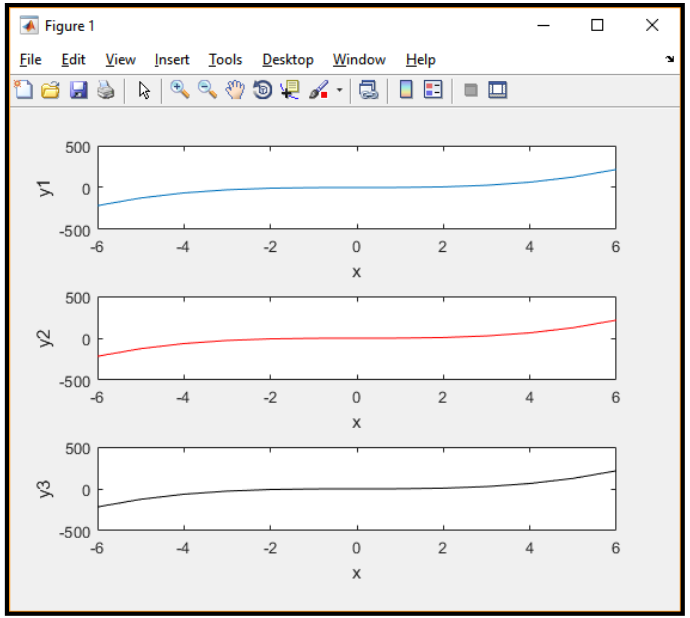
```
plot(x,y1,'rs')
hold on
plot(x,y2,'kx')
plot(x,y3,'bo')
```



SUBPLOTS

- A figure may contain more than one window, each known as a subplot

```
subplot(3,1,1)
plot(x,y1,'b')
xlabel('x')
ylabel('y1')
subplot(3,1,2)
plot(x,y2,'r')
xlabel('x')
ylabel('y2')
subplot(3,1,3)
plot(x,y3,'k')
xlabel('x')
ylabel('y3')
```



PLOTTING TIPS

- Always specify a dependent and independent variable
  - The variables need to be the same length
- Use a legend when plotting multiple curves in the same figure
- Always label your plots
- Use close all at the top of your script files

THE WORLD IS COMPLICATED

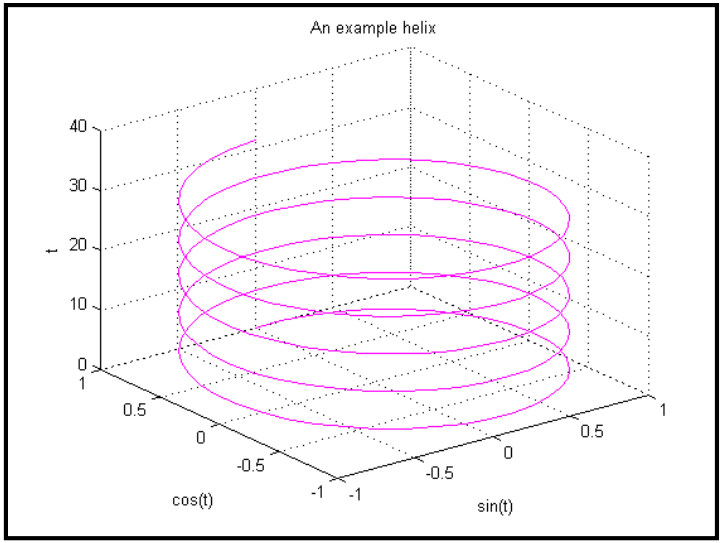
- Engineers regularly deal with multi-dimensional data
  - I.e. A variable may be a function of multiple variables
- As with 2D plots, 3D plots allow us to visualise data in a quick and interpretative manner
- Syntax of commonly used 3D plotting functions
  - 3D line plot: plot3(x, y, z)
  - Mesh plot: mesh(x, y, z)
  - Surface plot: surf(x, y, z)
  - Contour plot: contour(z, number_of_lines)

3D LINE PLOT EXAMPLE

- Plotting a helix:

```
t = linspace(0, 10*pi, 200);
    plot3(sin(t), cos(t), t);

    xlabel('sin(t)');
    ylabel('cos(t)');
    zlabel('t');
    title('An example helix');
    grid on;
```

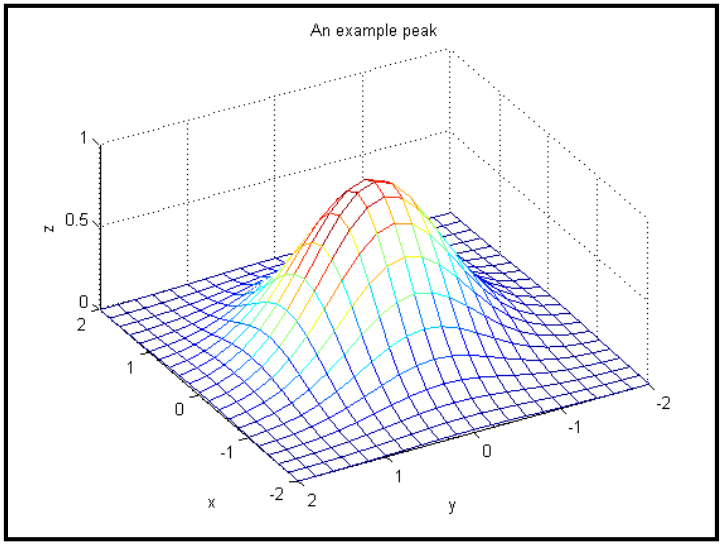


MESH PLOT EXAMPLE

- Viewing a 3D peak:

```
[x, y] = meshgrid(-2:0.2:2);
z = exp(-x.^2 – y.^2);

    mesh(x, y, z);
    xlabel('x');
    ylabel('y');
    zlabel('z');
    title('An example peak');
    grid on;
```

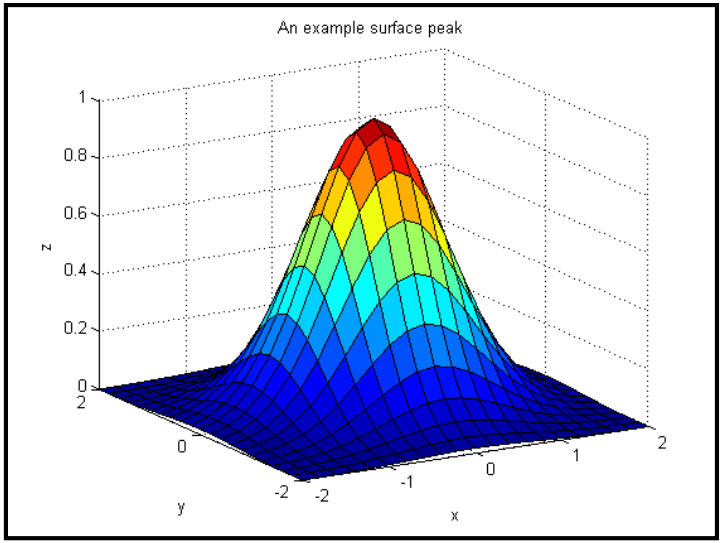


SURF PLOT EXAMPLE

- Viewing the surface of a peak

```
[x, y] = meshgrid(-2:0.2:2);
z = exp(-x.^2 – y.^2);

    surf(x, y, z);
    xlabel('x');
    ylabel('y');
    zlabel('z');
    title('An example surface peak');
    grid on;
```

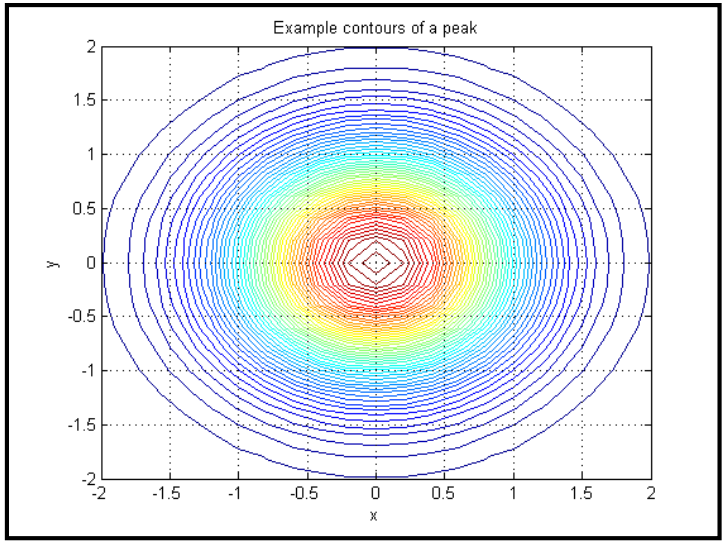


CONTOUR PLOT EXAMPLE

- Viewing the contours of a peak

```
[x, y] = meshgrid(-2:0.2:2);
z = exp(-x.^2 – y.^2);

    contour(x, y, z, 50);
    xlabel('x');
    ylabel('y');
    zlabel('z');
    title('Example contours of a peak');
    grid on;
```



SUMMARY

- Plot multiple data sets on the same figure window
- Create multiple subplot windows in the same figure
- There's more to plotting than just 2D data sets

- Is it possible to plot on logarithmically scaled axes as opposed to linearly scaled axes?