#### Matlab notes

- Matlab is a matrix-based, high-performance language for technical computing
- It integrates computation, visualisation and programming using familiar mathematical notation
- The name Matlab stands for *matrix laboratory*.

### Matrices

- A matrix is a rectangular array of numbers
- Special meaning is sometimes attached to 1×1 matrices, which are scalars, and to matrices with only one row or column, which are vectors
- The operations in Matlab are designed to be as natural as possible. Matlab allows you to work with entire matrices quickly and easily.

#### Matlab windows

There are typically three windows:

- the Command Window (where the main typing can be done)
- an editor (where you can type programs)
- figures (where the figures can be displayed and edited).

### Matlab help

- At any time, you can type "help topic" in the command window to find help on a particular topic
- You can also press the help button for a comprehensive overview.

#### Variables

- Variable names consist of a letter, followed by any number of letters, digits, or underscores
- Matlab is case sensitive: A and a are not the same variable
- To view the matrix assigned to any variable, simply enter the variable name.

# Entering matrices

• If you type

the output will be a 2×2 matrix

To stop the output showing, end with a semicolon; Thus, if you type

*b*=[5 6 7; 8 9 10];

there's no output, but any any time you can type b to see your 2×3 matrix.

### Vectors

 You can also generate a vector (which, remember, is a matrix with only one row or column) by using a colon:

x=0:10;

generates the vector [0 1 2 3 4 5 6 7 8 9 10]

 The default gap between numbers is 1, but you can make it finer by using two colons:

x=0:0.1:10;

generates [0 0.1 0.2 0.3 0.4… 9.8 9.9 10].

#### Operators

- You can use the regular function operators (+,-,\*,/,^,)
- But remember that Matlab is matrix-based
- So if A and B are matrices (or vectors) then A\*B will also be a matrix.

### Element by element operations

- What if you just want to multiply the elements of two vectors together?
- In this case, use a period before the operator. So

[1 2 3].\*[4 5 6]=[4 10 18]



## **M-files**

- M-files are text files containing Matlab code
- Use the Matlab Editor to create a file containing the same statements you would type at the Matlab command line
- Save the file under a name that ends in .m
- You probably want to save all your files in the same place.

# Figures

- The function *plot* is a linear 2D plot
- If you have vectors x and y that are the same size, then

plot(x,y)

plots the x vector on the horizontal (x) axis and the y vector on the vertical (y) axis.

### A plotting example

• To plot the function  $y = x^2$ , we write

• Notice the period before the power: this squares every element of the vector.

# Plotting multiple graphs

• If we want to plot  $y = x^2$  and  $z = x^3$  on the same graph, we write:

x=-5:0.1:5; y=x.^2; z=x.^3; plot(x,y,x,z)



### Getting started

- Start Matlab (Programs→Matlab)
- Command window: Click "New File"
- This creates an M-file.

# Type this in your M-file

%Don't forget the period! a=[1 2 3]; b=[4 5 6]; c=a.\*b

# Running your programs

- Save your M-file in the folder you created
- To run, use the green Run⊳ button (or ↓ □ on older versions)
- Change current Matlab directory  $\rightarrow$  Yes.

# Output

- Check the command window for the output
- Does this seem right?
- Type "help file" to in the command window and see what happens.

# Off you go

- Now you're ready to begin
- There's no data to load, you have to type the programs in yourself
- The first lab is Chapter 3's from the textbook
- Good luck!