WESTERN SYDNEY
UNIVERSITY

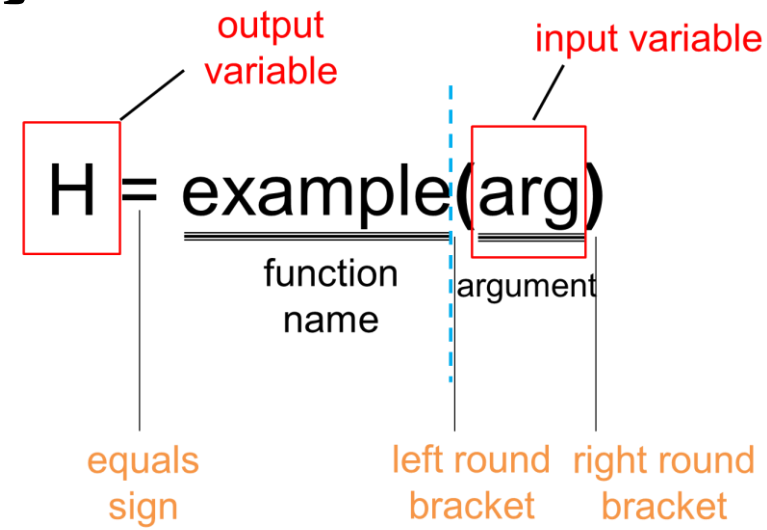
Module 2

Introduction to MATLAB Functions

What is a function?

- A computational expression that uses one or more input values to produce an output value.
- Functions that are readily useable in MATLAB are called ‘built-in’ functions.

Syntax of a function



MATLAB functions have 3 components:

input arguments(s), output arguments(s), and function name, for example:

```
b = tan(x)
```

x is the input argument, **b** is the output argument, and **tan** is the name of a built-in function; in this case, it is the tangent function with argument in radians.

MATLAB functions

- Functions take the form:

  variable(s) = function(number or variable(s))
- MATLAB has many functions stored in its file system.
- To use one of the built-in functions you need to know its name and what the input values are.
- For example, the square root function: **sqrt()**.
- To find the square root of 9 using MATLAB type:

```
sqrt(9)
```

Elementary Mathematical Functions

- MATLAB can perform all of the operations that your calculator can and more.
- Search for the topic 'elementary math' in the Help Navigator or click **here**
- Try the following in MATLAB to continue your exploration of MATLAB capabilities

```
sqrt(9)
```

ans=3

```
log(7)
```

ans=1.9459

of course, try a few others.

Rounding functions

- Sometimes it is necessary to round numbers. MATLAB provides several utilities to do this.

```
round(x)
fix(x)
floor(x)
ceil(x)
```

- What do they do?

```
>> x=[16.3 3.9 -2.1 -4.8]
x =
   16.3000    3.9000   -2.1000   -4.8000
>> round(x)
ans =
    16     4    -2    -5
>> fix(x)
ans =
    16     3    -2    -4
>> floor(x)
ans =
    16     3    -3    -5
>> ceil(x)
ans =
    17     4    -2    -4
```

Rounds towards the nearest integer

Rounds towards zero

Rounds towards -∞

Rounds towards +∞

Trigonometric functions

- MATLAB can compute numerous trigonometric functions, for angle arguments in radians:

  sin(), cos(), tan(), cot(), sec(), csc()

or for degree arguments:

  sind(), cosd(), tand(), cotd(), secd(), cscd()

- There is also inverse trigonometric functions that return an angle in radians:

  asin(), acos(), atan(), acot(), asec(), acsc()

or to return an angle in degrees use the following:

  asind(), acosd(), atand(), acotd(), asecd(), acscd()

Trigonometric functions

- To convert degrees to radians,

  degrees = pi/180 × radians

  Alternatively, use the deg**2**rad() function

- To convert radians to degrees, the conversion is based on the relationship:

  radians = 180/pi × degrees

  Alternatively, use the rad**2**deg() function

Examples

- sin(pi/3) gives 0.8660 – the input argument is taken in radians whereas sin(60) gives -0.3048 (once again the input argument is in radians)
- For an input in degrees
  - sind(60) gives 0.8660
  - cosd(60) gives 0.5
  - tand(45) gives 1.0

Noteworthy facts

- **pi** is a built-in constant in MATLAB.
- Numerical computations with decimal-point numbers are only approximate (just like your calculator). If you try to find **sin(pi)**, MATLAB will not return 0 as expected, but rather 1.2246e-016.

Data analysis functions

- It is often necessary to analyze data statistically.
- MATLAB has many statistical functions:

max()	sum()	size()
min()	prod()	length()
mean()	sort()	std()
median()	sortrows()	var()

Other useful functions

- To find the real and imaginary components of a complex number:

  real(c)

  imag(c)

- To find the absolute value or modulus of a complex number:

  abs(c)

- To find the angle or argument expressed in radians of a complex number:

  angle(c)

Other useful functions

- clock: produces an array that tells year, month, day, hour, min, sec.
- date: tells date
- pi: the number pi (3.141592653589.....)
- i: imaginary number % i = sqrt(-1)
- j: imaginary number % j = sqrt(-1)
- eps: smallest difference between two numerically-computed, adjacent real ('floating point') numbers = 2.2204e-016.