

Lab #1 – Introduction to MATLAB**1. MATLAB WINDOWs**

There are few basic tools show up when you run MATLAB and among those, I am mentioning about few important ones here:

- (i) **Command Window** (You can write the code here, but cannot save that for future use)
- (ii) **Editor** (You can write the code here and can save the code)
- (iii) **Workspace** (Shows the variables and their numerical values during a simulation)
- (iv) **Current Folder** (From where you are running your code)
- (v) **Help Browser** (You can take help regarding MATLAB commands from here)

We will discuss more about their usage and importance during the lab.

2. NUMBERS, FORMATS IN MATLAB

There are several formats for controlling the numerical values at the output display. You can get the full list by searching in the help section with a keyword "format". I am providing a small list below of mostly used ones:

Format	Description	Example
short	Fixed-decimal format with 4 digits after the decimal point. It's the default format of Matlab.	3.1416
long	Fixed-decimal format with 15 digits after the decimal point for double values, and 7 digits after the decimal point for single values.	3.141592653589793
shortE	Scientific notation with 4 digits after the decimal point.	3.1416e+00
longE	Scientific notation with 15 digits after the decimal point for double values, and 7 digits after the decimal point for single values.	3.141592653589793e+00
rat	Ratio of small integers.	5/2

N.B: In Matlab, every command starts with small letter. If you want to check any of these formats, for example try with long, write - format long in the command window. Then write any number and press enter. You will see the answer in the long format.

Matlab recognizes several different kinds of numbers

Type	Example	Type	Example
Integer	1234	Inf	Infinity
Real	1.234	NaN	Not a Number (0/0)
Complex	3+4i ("i" stands for imaginary)	pi	π

The “e” notation is used for very large or very small numbers: $1.35e+03 = 1.35 \times 10^3$. You can use “exp” to represent exponential.

3. BASIC OPERATORS & FUNCTIONS IN MATLAB

Arithmetic Operator

Symbol	Operation	Symbol	Operation
+	Addition	'	Conjugate Transpose
-	Subtraction	\	Left Division
*	Multiplication	/	Right Division
^	Power	=	Equals to (used to assign a value)

Relational Operator

Symbol	Operation	Symbol	Operation
<	Less than	~=	Not equal
>	Greater than	&	and
<=	Less than or equal		Or
>=	Greater than or equal	~	Not
==	Equal		

Important Basic Engineering Operator and Function

Operator/Function	Meaning	Operator/Function	Meaning
sqrt	Square root	round	Round to nearest integer
exp	Exponential	max	Maximum value
log	Natural logarithm (e base)	min	Minimum value
log10	Common logarithm (10 base)	angle	Phase angle
abs	Magnitude	conj	Complex conjugate
rem	Remainder after division	floor	

Trigonometric Function

Function	Meaning
sin, asin, sinh, asinh	sine, arcsine, hyperbolic sine, hyperbolic arcsine
cos, acos, cosh, acosh	cosine, arccosine, hyperbolic cosine, hyperbolic arccosine
tan, atan, tanh, atanh	tangent, arctangent, hyperbolic tangent, hyperbolic arctangent
cot, acot, coth, acoth	cotangent, arccotangent, hyperbolic cotan, hyperbolic arccotan
sec, asec, sech, asech	secant, arcsecant, hyperbolic secant, hyperbolic arcsecant
csc, asc, csch, asch	cosecant, arcosecant, hyperbolic cosecant, hyperbolic arcosecant

4. IMPORTANT TIPS & BASIC FUNCTION

- (i) Do not get confused while using (), {}, & [] parentheses. We use () to specify precedence of operations, enclose function input arguments, and index into an array. Remember we do not use {}, & [] parentheses to specify precedence of operations. We will learn more about {}, & [] in our next labs and other uses of ().
- (ii) Do not save your MATLAB file with only number or any function used in MATLAB. It may create error while running your code.

- (iii) Use `clc` and `clear` at the beginning of your code. `clc` clears all the text from the Command Window, resulting in a clear screen. After running `clc`, you cannot use the scroll bar in the Command Window to see previously displayed text. You can, however, use the up-arrow key \uparrow in the Command Window to recall statements from the command history. `clear` removes all variables from the current workspace, releasing them from system memory.

PRACTICE PROBLEMS

Compute the following mathematical expressions:

$$(a) (6 + 4i) \times (6 - 4i)$$

$$(b) 800 + [16 \times 4 \times \{5 - 3 \times (15 \div 3)\}]$$

$$(c) \sqrt{20 \times \frac{24}{7} - 12^4 + e^{1.32}}$$

$$(d) \frac{1}{2 + 3^2} + \frac{4}{5} \times \frac{6}{7}$$

$$(e) \cos(\pi) + \sin(\pi)$$

$$(f) \log(100) + \ln(100)$$

$$(g) \text{Find absolute value and angle of } (6 + 4i)$$

$$(h) \text{Find complex conjugate of } (5 - 4i)$$

$$(i) \text{Find the value of } \log(e^{2x+6y}); x = 2, y = 4$$

A SAMPLE MATLAB CODE

I want to find the value of an expression $3 \times \{(2x - y) + (5y - x)\}$ where $x = 5$ and $y = 5$

```
% This is our first lab document%
clc; % I am clearing the command window%
clear all; % I am clearing the workspace to remove previously stored variable if there is any%
x=5; % assigning value to variable x%
y=10; % assigning value to variable y%
A=3*((2*x-y) + (5*y-x)) % Calculating the value%
```