

Introduction to MATLAB

Our introduction follows, in part, section 1 of the excellent “An introduction to Matlab for dynamic modeling” by Guckenheimer and Ellner:

[www.cam.cornell.edu/~](http://www.cam.cornell.edu/~dmb/DMBsupplements.html)

[dmb/DMBsupplements.html](http://www.cam.cornell.edu/~dmb/DMBsupplements.html), as well as material from Prof. Mark Goldman, UC Davis

Command window (graphing calculator) mode

```
>> 1+3
```

```
ans =
```

```
4
```

Assigning values to variables

```
>> a=1+3
```

```
a =
```

```
4
```

Displaying values

```
>> a
```

```
a =
```

```
4
```

Suppressing display of output

```
>> a=1+3;
```

Two at once: comma or semicolon

```
>> a=2,b=4
```

```
a =
```

```
    2
```

```
b =
```

```
    4
```

```
>> a=2;b=4;
```

```
>> a=2 b=4
```

```
??? a=2 b=4
```

```
|
```

```
Error: Unexpected MATLAB expression.
```

FUNDAMENTAL PROGRAMMING SYNTAX:

- LHS = RHS
- value RHS assigned to LHS, NOT other way around

```
>> c=2
c =
    2
```

```
>> 2=c
??? 2=c
```

Error: The expression to the left of the equals sign is not a valid t

Another example:

```
>> a=2;b=4;
>> a=b;
>> a,b
```

```
a =    4
b =    4
```

```
>> a=2;b=4;
>> b=a;
>> a,b
```

```
a =    2
b =    2
```

Variable names:

```
>> a1=2  
>> my_favorite_variable_number_2=4
```

VALID: Letter followed by letters, numbers, underscore character.

NOTE! capitalization matters. $A \neq a$!!

NOT VALID:

```
>> my_favorite_variable#2=4  
??? my_favorite_variable#2=1  
>> 2a=1
```

Error: Unexpected MATLAB expression.

```
>> my.favorite.variable.name=1  
my =  
    favorite: [1x1 struct]
```

BASIC OPERATIONS:

Arithmetic

+
-
/ (divide)
* (multiply)
^ (exponent)
abs(x) (absolute value)
cos(x), sin(x), tan(x)
exp(x) exponential function e^x
log(x) log to base e
log10(x) log to base 10
sqrt(x) square root

The latter are built-in functions

```
>> a = sqrt(2)
a = 1.4142
>> a=2 ; b=4 ; c=a^b
c = 16
```

ORDER OF OPERATIONS:

PEMDAS

parenthesis
exponentiation
multiplication
division
addition
subtraction

Say we want: $a = 2$, $b = 4$, $c = \frac{a}{a+b}$

```
>> a=1 ; b=4 ; c=a/a+b
c = 5
```

```
>> a=1 ; b=4 ; c=a/(a+b)
c = 0.2000
```

!! When in doubt, put lots of parentheses !!

Variables stored in memory:

```
whos command
```

```
>> whos
```

Name	Size	Bytes	Class	Attributes
a	1x1	8	double	
b	1x1	8	double	
c	1x1	8	double	

OR look in “workspace” to see variables and values

OR just type variable at command line

```
>> a
```

```
a =      1
```

GOOD PRACTICE: clear variables before starting to program

```
>> clear all
```

```
>> whos
```

Commands stored in memory:

See command history, or just hit “up arrow”

Display more digits:

```
>> a=0.1
```

```
a =  
    0.1000
```

```
>> format long
```

```
>> a  
a =    0.1000000000000000
```

```
>> a=4/3 ; b=a-1 ; c = (3*b)-1
```

```
c =  
-2.220446049250313e-16
```

```
>> a=10^400
```

```
a =    Inf
```

```
>> a=10^-400
```

```
a =    0
```

```
>> 0/0
```

```
ans =
```

```
NaN
```

HELP !!

How does a command or function work?

```
>> help sqrt
```

```
SQRT    Square root.
```

```
    SQRT(X) is the square root of the elements of X. Complex results are produced if X is not positive.
```

```
    See also sqrtm, realsqrt, hypot.
```

```
    Reference page in Help browser
```

```
        doc sqrt
```

```
>> doc sqrt
```

Thanks anyway, but what **SHOULD** I be looking up? the lookfor command

```
>> lookfor exponent
```

```
EXP      Exponential.
```

```
EXPINT   Exponential integral function.
```

```
EXPM     Matrix exponential.
```

```
expmdemo.m: %% Matrix Exponentials
```

```
EXPMDEMO1 Matrix exponential via Pade approximation.
```

```
...
```

OR, type doc, and use search dialogue box

... and – see manual linked from webpage, resources on web, matlab references in library under 301 course reserve