



Matlab online

Kim Mathiassen

15.02.2011



UNIVERSITY
OF OSLO



Matlab intro
Command window
Getting help

Arrays and matrices

Graphs

Script files and functions

What is Matlab?

- ▶ A programming language for numerical computations
- ▶ Widely used in research and industry
- ▶ Has many toolboxes that are used for signal processing, image analysis, optimization and control systems

Simulink

- ▶ A tool for modeling, simulating and analyzing multidomain dynamic systems
- ▶ It is a part of Matlab
- ▶ A graphical programming environment

Command window

All commands can be written in the command window.

Calculating values

```
>> 4*5+3  
ans =  
    23
```

Assigne values to parameters

```
>> a = 5  
a =  
    5
```

Command window

Calling functions

```
>> sin(0.5*pi)
ans =
    1
```

Suppressing output

By placing a ';' at the end of the line suppresses the output

```
>> sin(0.5*pi);
```

Getting help

To get help on a function simply type 'help function_name'. One get autocompletion with tab.

Help

```
>> help sin
SIN      Sine of argument in radians.
        SIN(X) is the sine of the elements of X.

See also asin, sind.

Overloaded methods:
    codistributed/sin

Reference page in Help browser
    doc sin
```

Defining arrays

Defining array with start and stop value

```
>> x = 0:0.2:1
x =
    0    0.2000    0.4000    0.6000    0.8000    1.0000
```

Defining array with a list

```
>> x = [1 2 3 4]
x =
    1     2     3     4
```

Defining a matrix

Defining a matrix

```
>> A = [1,2,3;4,5,6;7,8,9]
```

```
A =
```

```
     1     2     3
     4     5     6
     7     8     9
```

Defining a matrix with functions

```
>> A = zeros(3,4); % 3x4 matrix, elements are zero
```

```
>> B = ones(3); % 3x4 matrix, elements are ones
```

```
>> C = eye(3); % 3x3 identity matrix
```


Accessing matrices

Accessing matrices

```
a(1,2) % Gives the element on the 1st row
        % and 2nd column of a
a(1,:) % Gives the 1st row of a
a(:,3) % Gives the 3rd column of a
a(:,2)=[10;10;10] % Changes the 2nd column of a into a
                  % column with 10's only. Only works
                  % if a is a nx3 matrix with n larger
                  % than or equals 2
b(1) % The 1st element of b in case b contains either
      % one row or one column
```

Math operations

Linear algebra

```
>> x=[1,2,3];  
>> x*x'      % ' means transpose  
ans =  
    14
```

Element wise

```
>> x=[1,2,3];  
>> x.*x      % .* means element wise multiplication  
ans =  
     1     4     9
```

Graphs

Plot one graph

```
x = 0:0.1:5;  
y = x.^2;  
plot(x,y)           % plots x and y in a graph  
title('y = x^2');  % sets the title of the graph  
xlabel('x');        % sets the x label  
ylabel('y');        % sets the y label
```

Graphs

Plot two graph

```
x = 0:0.1:5;
y = x.^2;
z = 1./(x+1);
plot(x,y)           % plots x and y in a graph
hold on            % tells matlab not to "overwrite"
                   % the graph
plot(x,z,'r')      % third parameter is line type,
                   % r means red
title('Two plots'); % sets the title of the graph
xlabel('x');        % sets the x label
ylabel('y');        % sets the y label
legend('x^2','1/(x+1)') % displays a legend
```

m-files

- ▶ One can create script by putting the code in .m-files
- ▶ The scripts can be run by pressing the play button
- ▶ One can press Ctrl+Enter for a shortcut to run the script
- ▶ '%%' starts cell mode, which makes you able to run a part of a script

User defined functions

f.m

```
function y = f(x)
y = x.^2 + exp(x);
```

g.m

```
function [z_1, z_2] = g(x,y)
z_1 = 2*x + y;
z_2 = x + 2*y;
```

Source

<http://www.imc.tue.nl/>