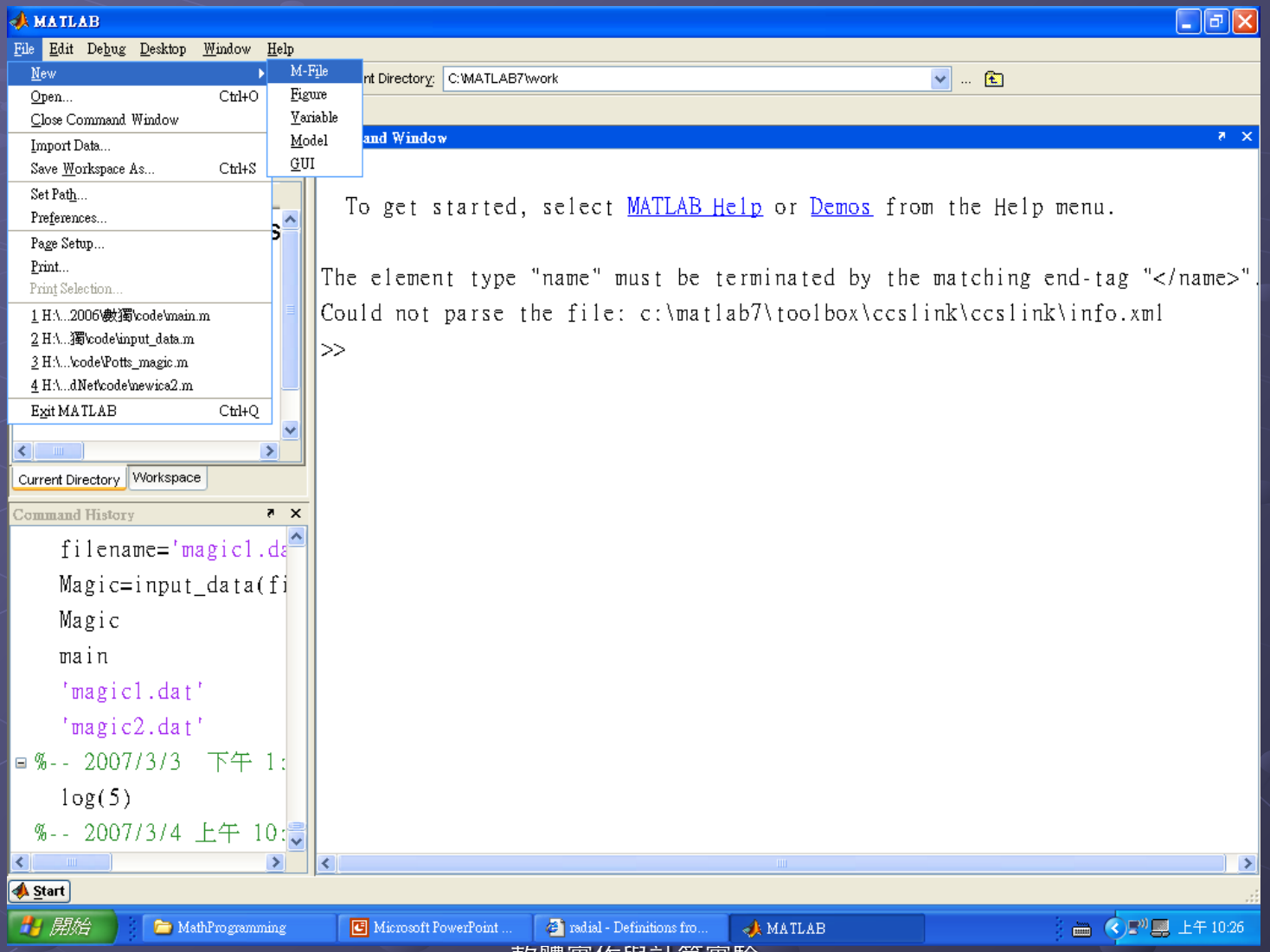
Matlab programs

- Functions
  - Function name
  - Input
  - Output
- Script
  - A set of instructions

Example: circle area

- Write a Matlab function to calculate the area of a circle
  - Input: the radius of a circle
  - Function body
  - Output: the area of a circle

M file


MATLAB
File Edit Debug Desktop Window Help
New
Open... Ctrl+O
Close Command Window
Import Data...
Save Workspace As... Ctrl+S
Set Path...
Preferences...
Page Setup...
Print...
Print Selection...
1 H:\...2006\數獨\code\main.m
2 H:\...獨\code\input_data.m
3 H:\...\code\Potts_magic.m
4 H:\...dNet\code\newica2.m
Exit MATLAB Ctrl+Q
M-File
Figure
Variable
Model
GUI
C:\MATLAB7\work
To get started, select MATLAB Help or Demos from the Help menu.
The element type "name" must be terminated by the matching end-tag "</name>".
Could not parse the file: c:\matlab7\toolbox\ccslink\ccslink\info.xml
>>
Current Directory
Workspace
Command History
filename='magic1.da
Magic=input_data(fi
Magic
main
'magic1.dat'
'magic2.dat'
%-- 2007/3/3 下午 1:
log(5)
%-- 2007/3/4 上午 10:
Start
開始
MathProgramming
Microsoft PowerPoint ...
radial - Definitions fro...
MATLAB
上午 10:26

circle_area.m

get source codes

Head

```
function A=circle_area(r)
% A=circle_area(r)
% r: radius of a circle
% A: area of a circle with radius r
% JM Wu 3/3/07
    A=pi*r^2;
return
```

Matlab Function

- File name could be same as function name
- Format
  - Function Head:

    ```
    function A=circle_area(r)
    ```

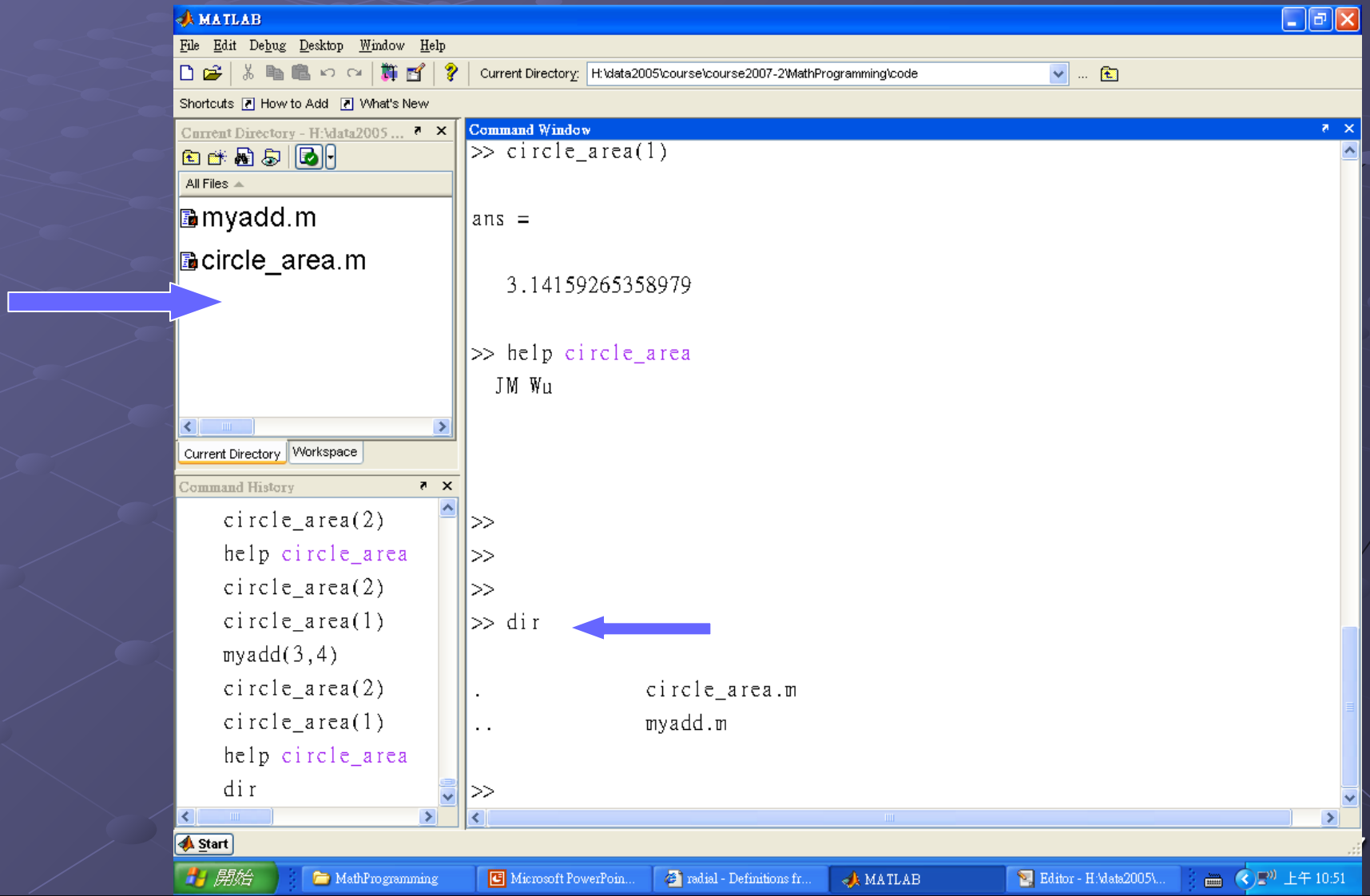
    - Output: A
    - Function name: circle_area
    - Input: r
  - Body:

    a set of instructions that are executed to attain function output
  - Return

Comments

- Leading character
  %
- Matlab engine ignores comments

View files in current directory



Help circle_area

- List comments just below function head
- Users can use help to query how to use a matlab function

Help circle_area

```
>> help circle_area
  A=circle_area(r)
  r: radius of a circle
  A: area of a circle with radius r
  JM Wu 3/3/07
```

Function Call

```
>> circle_area(2)

ans =

    12.5664
```

- Matlab engine displays the area of a circle with radius 2

Function call

```
>> A=circle_area(2)

A =

    12.5664
```

- Matlab engine displays the area of a circle with radius 2 and assign the output to variable A

Function call

```
>> A=circle_area(2);
>>
```

Matlab engine assigns the output to variable A

Multiple input arguments

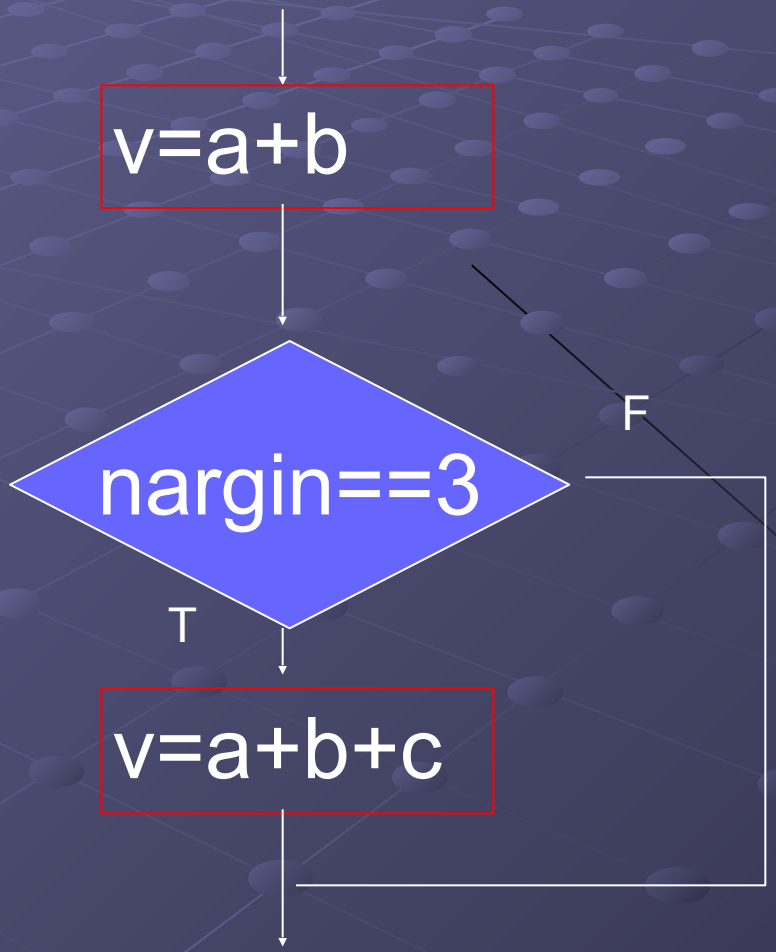
get source

```
function v=myadd(a,b,c)
% v=myadd(a,b,c)
% v=myadd(a,b)
% Add two or three items
% Use nargin to check the number of given input arguments
v=a+b;
if nargin==3
    v=a+b+c;
end
return
```

nargin

- Matlab automatically sets variable nargin to the number of inputs.

Flow control



if

if nargin==3

- v=a+b+c;
- end
- Condition expression:
  - nargin==3
    - True or false
    - == : check identity of two variables
- If the condition expression is true, execute the instruction, v=a+b+c.

myadd

```
>> myadd(1,2,3)

ans =

     6
```

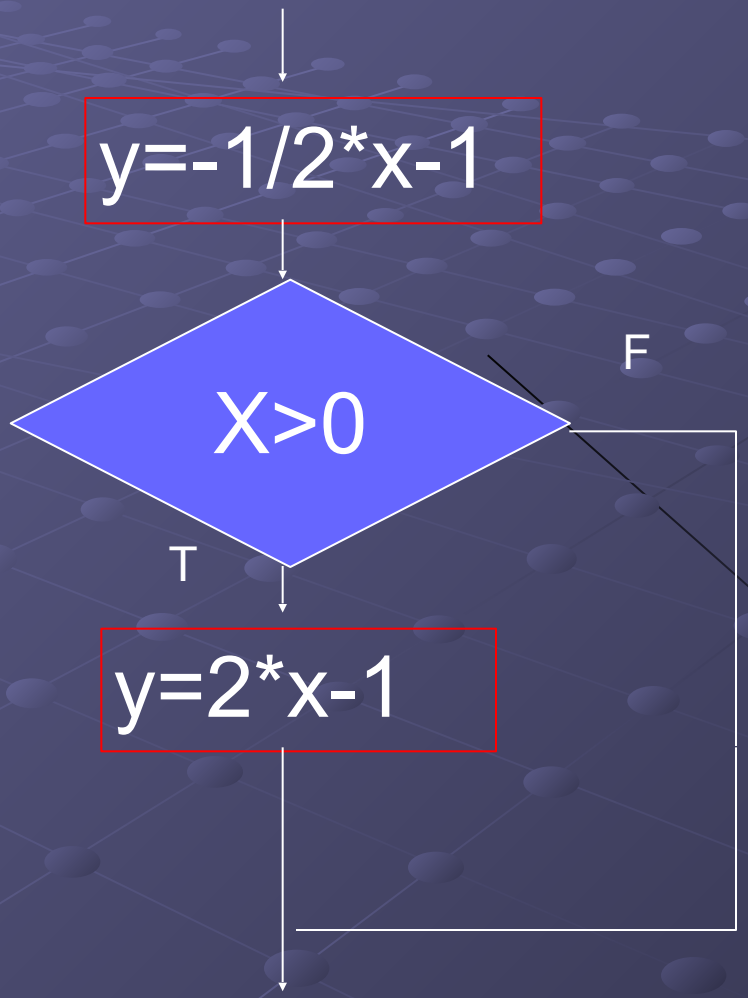
```
>> myadd(1,2)

ans =

     3
```

Piecewise functions

$$f(x) = 2x - 1 \quad \text{if } x > 0$$

$$= -\frac{1}{2}x - 1 \quad \text{otherwise}$$

Flow control



pwfun

```
function y=pwfun(x)
y=-1/2*x-1;
if x > 0
    y=2*x-1;
end
```

pwfun.m

Piecewise functions

$$f(x) = 2x - 1 \quad \text{if } x > 0$$

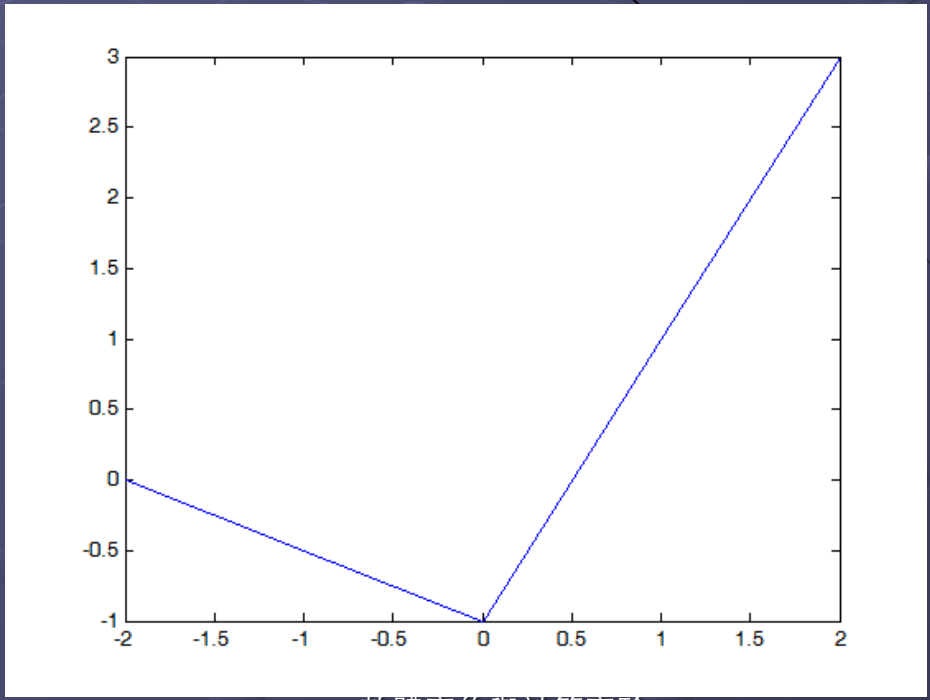
$$= -\frac{1}{2}x - 1 \quad \text{otherwise}$$

```
>> a=[pwfun(-2) pwfun(-1) pwfun(0) pwfun(1) pwfun(2)]

a =

         0   -0.5000   -1.0000    1.0000    3.0000

>> plot(-2:1:2,a)
```

Piecewise functions

$$f(x) = 2x - 1 \quad \text{if } x > 0$$

$$= -\frac{1}{2}x - 1 \quad \text{otherwise}$$



Logic expressions

True or false

1 <= 0

1 ~= 2 - 1

v=[1 2 3]; v(3)==3

v(2) > 0

v(1) < 2 & v(3) > 2

0.5 < v(1) & v(1) <= 1.5

v(1)+v(2)+v(3) > 10

sum(v) > 5

v(3)^3 > 27

Exercise

Get exercise

Multiple output arguments

size(A)

- A denotes a matrix
- A = [1 2 3;4 5 6]
- size(A)

  returns numbers of rows and columns of A

size()

```
>> A=[1 2 3;4 5 6]

A =

     1     2     3
     4     5     6

>> size(A)

ans =

     2     3
```

length()

- length(v)
  - v is a row or column vector
  - Return the number of elements in v
- v(i)
  - specify the ith element of vector v

Assignment

```
a=1;
b=2;
% swap a,b
temp=a;
a=b;
b=temp;
```

Script

- A script is composed of a set of instructions
- New a script
- Keyin instructions

```
a=1;
b=2;
% swap a,b
temp=a;
a=b;
b=temp;
```

swap.m

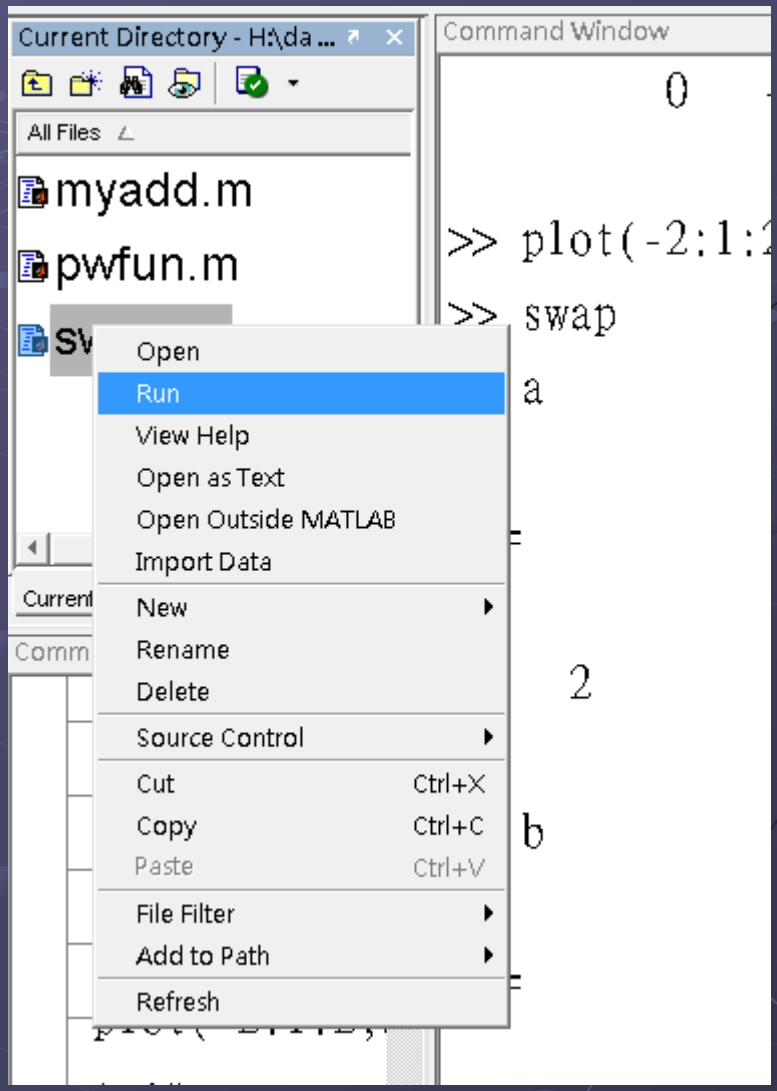
Execution of a script

- Execution of a script
  - Specify the filename in command window

```
>> swap
>> a

a =

     2

>> b

b =

     1
```

Run a script

1. Move mouse to a script
2. Click right botton
3. Select run



Run a script

1. Select edit window
2. Open a script
3. Move mouse to an icon for running a script
4. Press the icon