Introduction to MATLAB

3: M-files

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M-files

1) Script files

- A sequence of commands that we could also type in the Command window.
- All variables appear in the Work Space

2) Function m-files

- Header defining input and output variables
- All other variables are internal, not visible in the Work Space

Function m-files

Header

```
function [out1, out2, ….]=funname(inp1, inp2, ….)

function [out1]=funname(inp1, inp2, ….)

function out1=funname(inp1, inp2, ….)

function [ ]=funname()
```

Comments

```
% Comments
% Write anything you want to describe your function
% Comments after the header will appear if you type
%            >> help funname
%  Other comments won't appear….
```

Statements

Other subfunctions

Functions that can be used only by funname

Function m-files

Consider a function m-file with the following header

```
function [sum1, prod1] = sumprod( a, b, c)
```

where *a*, *b* and *c* are numbers.
We can call sumprod in many ways like:

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

or

```
>> [x,y] = sumprod( 3, 2, 1)
```

If we use

```
>> z = sumprod(3,2,1)
```

then z will be assigned the value of the output variable sum1.

sumprod.m

```
function [sum1 prod1] = sumprod (x1, x2, x3)

% function [sum1, prod1] = sumprod (x1, x2, x3)
% Calculates the sum and the product of of x1, x2, x3
%
%
    sum1  = x1+x2+x3;
    prod1 = x1*x2*x3;

% End of sumprod.m
```

Functions without input and output arguments

Examples: date, clock, pi

```
function []=star()
%  STAR
%   Example of a function m-file
%  without input and output arguments
%  Plot of a star
theta=pi/2:.8*pi:4.8*pi;
r=ones(1,6);
polar(theta,r)
% End of STAR
```

Variables theta and r are local.

nargin and nargout

- nargin : number of input arguments supplied by the user
- nargout: number of output arguments demanded by the user

```
>> nargin('sin')
ans =
     1
>> nargin('rem')
ans =
     2
>> nargout('cond')
ans =
     1
>> nargout('eig')
ans =
     2
>>
```

Mathematical functions

$$f(x) = \frac{4x^2}{x^4 + 2}$$

```
function y=fun1(x)
%   FUN1
%  --------
%   y = 4 x^2/(x^4+2)
y = 4*x.^2./(x.^4+2);
```

Mathematical functions

$$g(x,y)=e^{-xy}+\left(x^2+y^2\right)\cos(y)$$

```
function z=fun2(x,y)
%   FUN2
%  -----
%
z = exp(x.*y)+(x.^2+y.^2).*cos(y);
```

Anonymous functions

$$f(x) = \frac{4x^2}{x^4 + 2}$$

```
fun1a=@(x) 4*x.^2./(x.^4+2);
```

$$g(x,y) = e^{-xy} + \left(x^2 + y^2\right)\cos(y)$$

```
fun2a=@(x,y) exp(x.*y)+(x.^2+y.^2).*cos(y);
```

Plotting functions

$$f(x)$$

```
ezplot(fun1a)

fplot(fun1a, [0, 4])
```

$$f(x,y)$$

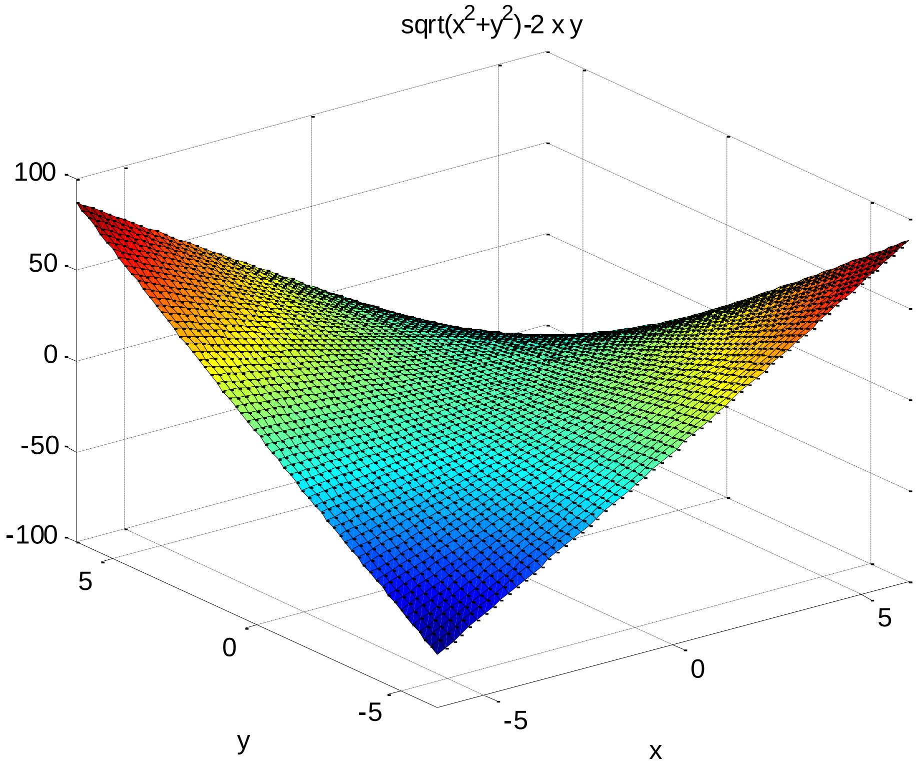
```
ezsurf(fun2a)

ezcontour(fun2a)

ezcontourf(fun2a)
```

Example

```
>> g1 = @(x,y) sqrt(x.^2+y.^2) - 2*x.*y
g1 =
    @(x,y)sqrt(x.^2+y.^2)-2*x.*y
>> ezsurf(g1)
```



Thank you!!