Today's lecture we will see how to write and call a function, with multiple input and output arguments. We will learn how to make different types pf plots: scatter plots, besides bar, histograms, stem plots, area plots and pie charts, we will also explore three dimensional plots.

1   Functions

1.1   Function Definitions

A MATLAB function consists of

- The header: the word function, the output argument followed by the assignment operator (=), the name of function, and the input arguments.

- The body: includes statements and assign a value to the output argument.

For example, we write a function as follow

```
function y= examplefunct(x)
y=2*x;
end
```

This function called "examplefunct" is stored in a file called examplefunct.m

1.2   Calling a function

I call the function by giving it a value $examplefunct(...)$

```
examplefunct(17)
```

Or a random value

```
examplefunct(rand)
```

Or the return value can be assign to another value

```
z=examplefunct(18);
```

1.3   Function with multiple input arguments

```
function y= examplefuncttwo(x,r)
y=2*(x+r);
end
```

I call the function by giving it two input values

```
examplefuncttwo(17,6)
```

1.4   Functions that return more than one value

```
function [y, f]= examplefunctthree(x,r)
y=2*(x+r);
f = y*2*pi;
end

[a1 a2] =examplefunctthree(5,6)
```

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1.5   Choosing from many options.

The following function receives an integer, which should be in the range from 0 to 10. The program then returns a corresponding result: pass or fail

```
function grade = examplegrade(quiz)

% First, error-check
if quiz < 0 || quiz > 10
grade = 'X';
% If here, it is valid so figure out the
% corresponding letter grade
elseif quiz == 8 ||quiz == 9 || quiz == 10
grade = 'pass';
else
 grade = 'fail';
end


quiz = 8;
lettergrade = examplegrade(quiz)

quiz = 7;
lettergrade = examplegrade(quiz)
```

1.6   Function functions

Used to pass functions to other functions

```
function fnfnexamp1(funh)
% This is an example of a function function. The handle of a function
% is passed and that function of x is plotted
x = 1:.25:6;
y = funh(x);
plot(x,y,'ko')
```

We call this function by

```
fnfnexamp1(@sin)
```

2   Plots

2.1   Scatter plots

```
N=60;
x = linspace(0,100,N);
y=exp(-x/10).*x.^2;
scatter(x,y);
```

I change the size of markers

```
scatter(x,y,200);
```

I specify the color

```
scatter(x,y,200,'r');
```

I fill in the markers

```
scatter(x,y,200,'r','filled');
```

2.2   Bar and barh plots

```
rm = randi([1 50],2,4);
bar(rm)

bar(rm,'stack')

barh(rm)
```

2.3   Histograms

```
vec = randi([1 10],1,12);
hist(vec)
```

2.4   Pie charts

```
pie(vec)
```

2.5   Three-dimensional plots

2.5.1   Plot 3d

```
x = 1:5;
y = [0 -4 3 12 5];
z = 2:2:10;
plot3(x,y,z,'k*')
grid
```

2.5.2   Bar 3d

```
x = 1:6;
y = [30 14 4 10 25 31];
bar3(x,y)
```

2.5.3   Pie 3d

```
pie3([3 10 5 2])
```

2.6   Subplot

```
x = 1:6;
y = [33 11 5 9 22 30];
subplot(2,2,1)
bar(x,y)
title('bar')
subplot(2,2,2)
barh(x,y)
title('barh')
subplot(2,2,3)
area(x,y)
title('area')
subplot(2,2,4)
stem(x,y)
title('stem')
```

The End.