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	MATLAB The Language of Technical Computing
	MATLAB numerical computing

University Of Anbar
College Of Science
Math Department

MATRIX - LABORATORY (MATLAB)

Lecture 3

Built-in Functions

By:

Safwat A. Hamad

For the 2nd stage Math Department

1. Topics related to Variables

The *who* and *whos* command :

The who function in MATLAB displays the names of all variables in the current workspace. It can also be used to display the names of variables in a specific MAT-file or to display the names of variables that match a regular expression.

To use the *who* function, simply type *who* in the Command Window and press Enter. This will display a list of all variables in the current workspace, along with their data types. For example, if you have the following variables in your workspace:

```
>> x = 5;

>> y = 'Hello, world!';

>> z = [1, 2, 3];
```

Then typing *who* in the Command Window and pressing Enter will display the following output:

```
Variable    Class
x           double
y           char
z           double
```

The commend *whos* shows variables that have been defined in this Command Window (this shows more information on the variables, similar to what is in the Workspace Window), To use the *whos* function, simply type *whos* in the Command Window and press Enter. This will display a list of all variables in the current workspace, along with their size, type, and number of bytes allocated.

For example, if you have the following variables in your workspace:

```
>> x = 5;

>> y = 'Hello, world!';

>> z = [1, 2, 3];
```

Then typing *whos* in the Command Window and pressing Enter will display the following output:

```
Name        Size                Bytes  Class     Attributes
x            1x1                  8  double
y            1x12                 12  char
z            1x3                  24  double
```

If nothing appears when *who* or *whos* is entered, that means there aren't any variables! For example, in the beginning of a MATLAB session, variables could be created and then selectively cleared (remember that the semicolon suppresses output).

The *Format* command :

The default in MATLAB is to display numbers that have decimal points with four decimal places, as shown in this example.

```
>> x = 2 * sin(1.4)

x =

  1.9709
```

(The default means if you do not specify otherwise, this is what you get.) The format command can be used to specify the output format of expressions. There are many options, including making the format short (the default) or long. For example, changing the format to long will result in 15 decimal places. This will remain in effect until the format is changed back to short, as demonstrated in the following.

```
>> format long

>> x = 2 * sin(1.4)

x =

  1.970899459976920

>> format short

>> x = 2 * sin(1.4)

  x = 1.9709
```

The *format bank* command in MATLAB sets the output format to bank format. This format displays numbers with two decimal places, and negative numbers in parentheses. To use the format bank command, simply type *format bank* in the Command Window and press Enter. This will change the output format to bank format for all subsequent MATLAB operations.

For example, the following code displays the value of the variable *x* in bank format:

```
x = 123.45;

format bank;

disp(x);
```

This will display the following output to the Command Window:

```
x =

   123.45
```

2. Functions in MATLAB

A built-in function in MATLAB is a function that is implemented as part of the MATLAB language. Built-in functions are typically very fast and efficient, as they are optimized for performance. There are many built-in functions in MATLAB, and they cover a wide range of topics, including:

- Mathematical operations
- Matrix operations
- Statistical operations
- Signal processing operations
- Image processing operations

In this section, we listed some of built-in functions in MATLAB:

1. Sqrt: Returns the square root of a number.

```
>> sqrt_num = sqrt(2)

sqrt_num =

      1.4142
```

2. Factorial : It calculates the factorial of a number, which is the product of all the positive integers less than or equal to that number.

```
>> factorial(5)

ans =

      120
```

3. Round : represent rounds numbers to the nearest integer. It can also be used to round numbers to a specified number of decimal places.

```
>> round (4.7)

ans =

     5
```

Exp: two digits

```
round (2.45567, 2)

ans =

    2.4600
```

4. Exponential: calculates the exponential of a number. The exponential of a number is the result of raising the number to the power of ***e***, where ***e*** is the mathematical constant approximately equal to 2.71828.

```
exp (2)

ans =

    7.3891
```

5. Rem: calculates the remainder of dividing two numbers. The remainder is the difference between the two numbers divided by the divisor, where the divisor is the number that we are dividing by.

```
>> rem (10, 3)

ans =

     1
```

Exp: mod

```
mod (9, 2)

ans =

     1
```

6. Absolute: Returns the absolute value of a number.

```
>> abs (-19)

ans =

    19
```

7. Plus: calculates the sum for two numbers

```
>> plus (5,5)

ans =

    10
```

8. Sin: Returns the sine of an angle in radians.

```
>> sin (30)

ans =

   -0.9880
```

9. Cos : calculates the cosine of an angle in radians.

```
>> cos (65)

ans =

   -0.5625
```

10. Logarithm : the natural logarithm is represented by the command log and the logarithm to the base 10 is represented by the command log10. Here are two examples to illustrate this:

```
>> log (4)

ans =

    1.3863
```

Exp: base 10

```
>> log10 (4)

ans =

    0.6021
```

11. Power : calculate power of the number.

```
>> power (3,2)

ans =

     9
```

H.W. : Explain the following functions

- Ceil
- Floor
- Fix