

Computer Science II

Environmental Engineering Second Level 2024-2025 1st Course

Lecture #2

Programming with MATLAB (Cont.)

5. Controlling the appearance of floating point number

MATLAB by default displays only 4 decimals in the result of the calculations, for example -163.6667 , as shown in above examples. However, MATLAB does numerical calculations in double precision, which is 15 digits. The command ***format*** controls how the results of computations are displayed. Here are some examples of the different formats together with the resulting outputs.

```
>> format short
```

```
>> x= -163.6667
```

5. Controlling the appearance of floating point number (Cont.)

If we want to see all 15 digits, we use the command ***format long***

```
>> format long
```

```
>> x= -1.6366666666666667e+002
```

To return to the standard format, enter ***format short***, or simply ***format***. There are several other formats. For more details, see the MATLAB documentation, or type `help format`.

6. Managing the workspace

The contents of the workspace persist between the executions of separate commands. Therefore, it is possible for the results of one problem to have an effect on the next one. To avoid this possibility, it is a good idea to issue a *clear* command at the start of each new independent calculation.

```
>> clear
```

6. Managing the workspace (Cont.)

The command `clear` or `clear all` removes all variables from the workspace. This frees up system memory. In order to display a list of the variables currently in the memory.

To clear the Command Window, type `clc`, it is in the start of program.

```
>> clc
```

7. Entering multiple statements per line

It is possible to enter multiple statements per line. Use commas (,) or semicolons (;) to enter more than one statement at once. Commas (,) allow multiple statements per line without suppressing output.

```
>> a=7; b=cos(a), c=cosh(a)
```

```
b =0.6570
```

```
c = 548.3170
```

8. Getting help

To view the online documentation, select MATLAB Help from Help menu or MATLAB Help directly in the Command Window. The information about any command is available by typing:

```
>> help Command
```

Ex: to find sqrt expression

```
>> help sqrt
```

Or by using the key of F1 in keyboard.

9. Mathematical functions

MATLAB offers many predefined mathematical functions for technical computing which contains a large set of mathematical functions.

Typing ***help elfun*** and ***help specfun*** calls up full lists of elementary and special functions respectively.

There is a long list of mathematical functions that are built into MATLAB. These functions are called built-ins. Many standard mathematical functions, such as $\sin(x)$, $\cos(x)$, $\tan(x)$, $\exp(x)$, $\ln(x)$, are evaluated by the functions `sin`, `cos`, `tan`, `exp`, and `log` respectively in MATLAB.

9. Mathematical functions (Cont.)

Table below lists some commonly used functions, where variables x and y can be numbers, vectors, or matrices:

Elementary functions

<code>cos(x)</code>	Cosine	<code>abs(x)</code>	Absolute value
<code>sin(x)</code>	Sine	<code>sign(x)</code>	Signum function
<code>tan(x)</code>	Tangent	<code>max(x)</code>	Maximum value
<code>acos(x)</code>	Arc cosine	<code>min(x)</code>	Minimum value
<code>asin(x)</code>	Arc sine	<code>ceil(x)</code>	Round towards $+\infty$
<code>atan(x)</code>	Arc tangent	<code>floor(x)</code>	Round towards $-\infty$
<code>exp(x)</code>	Exponential	<code>round(x)</code>	Round to nearest integer
<code>sqrt(x)</code>	Square root	<code>rem(x)</code>	Remainder after division
<code>log(x)</code>	Natural logarithm	<code>angle(x)</code>	Phase angle
<code>log10(x)</code>	Common logarithm	<code>conj(x)</code>	Complex conjugate

9. Mathematical functions (Cont.)

In addition to the elementary functions, MATLAB includes a number of predefined constant values. A list of the most common values is given in Table below:

Predefined constant values

pi	The π number, $\pi = 3.14159 \dots$
i, j	The imaginary unit i , $\sqrt{-1}$
Inf	The infinity, ∞
NaN	Not a number

9. Mathematical functions (Cont.)

Examples:

As a first example, the value of the expression: $y = e^{-a} \sin(x) + 10\sqrt{y}, : 5,$

x = 2, and y = 8 is computed by:

```
>> a = 5; x = 2; y = 8;
```

```
>> y = exp(-a)*sin(x)+10*sqrt(y)
```

```
y =
```

```
28.2904
```

9. Mathematical functions (Cont.)

Examples:

The subsequent examples are:

```
>> log (142)
```

```
ans =
```

```
4.9558
```

```
>> log10 (142)
```

```
ans =
```

```
2.1523
```

9. Mathematical functions (Cont.)

Notes:

- Only use built-in functions on the right hand side of an expression. Reassigning the value to a built-in function can create problems.
- There are some exceptions. For example, i and j are pre-assigned to $\sqrt{-1}$.
However, one or both of i or j are often used as loop indices.
- To avoid any possible confusion, it is suggested to use instead ii or jj as loop indices.