Computer Programming: Starting with MATLAB

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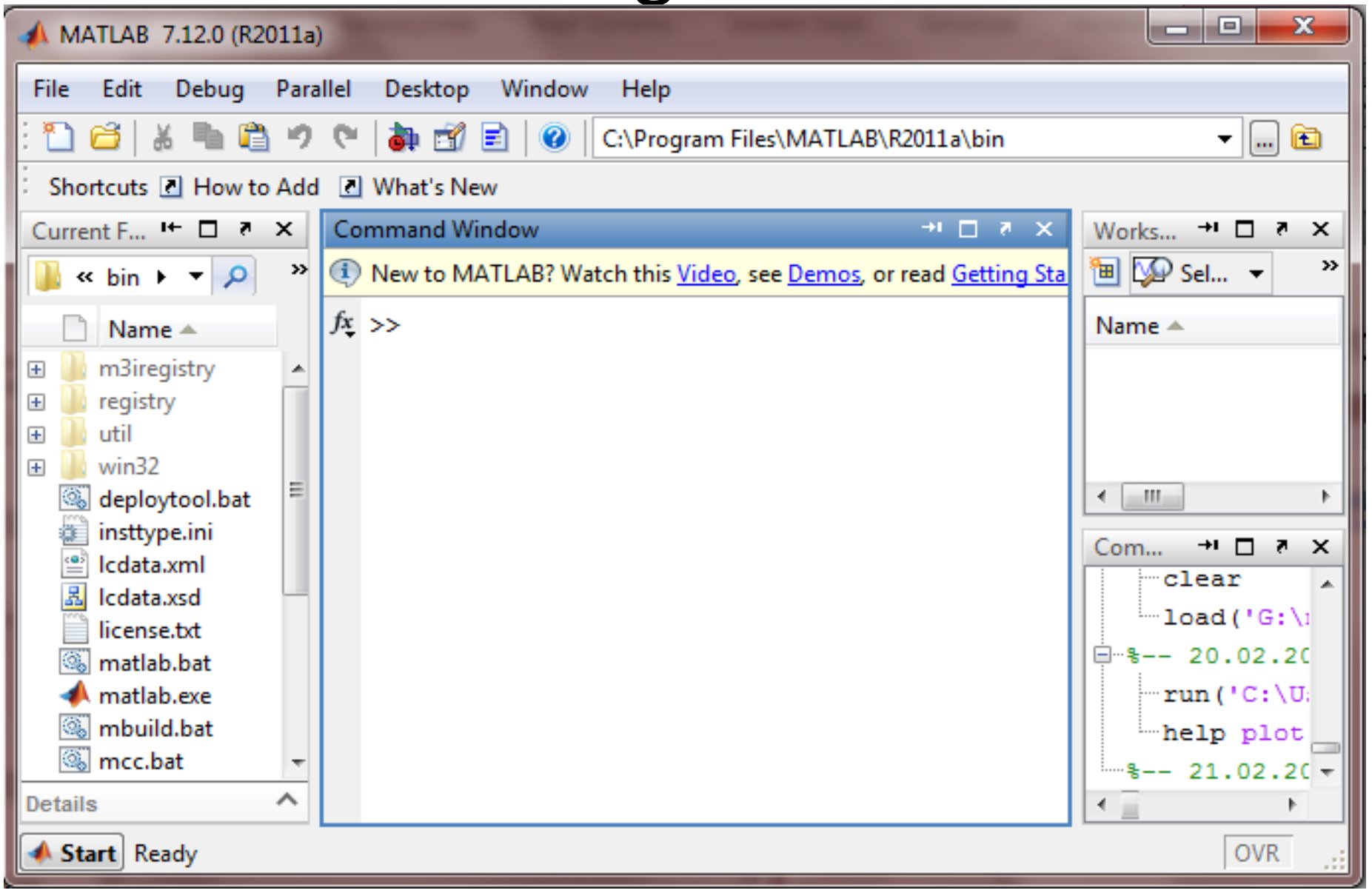
Outline

- Matlab Environment
- Working in the Command Window
- Using MATLAB as a Calculator
- Display Formats
- Elementary Functions
- Variables
- Script Files
- Examples

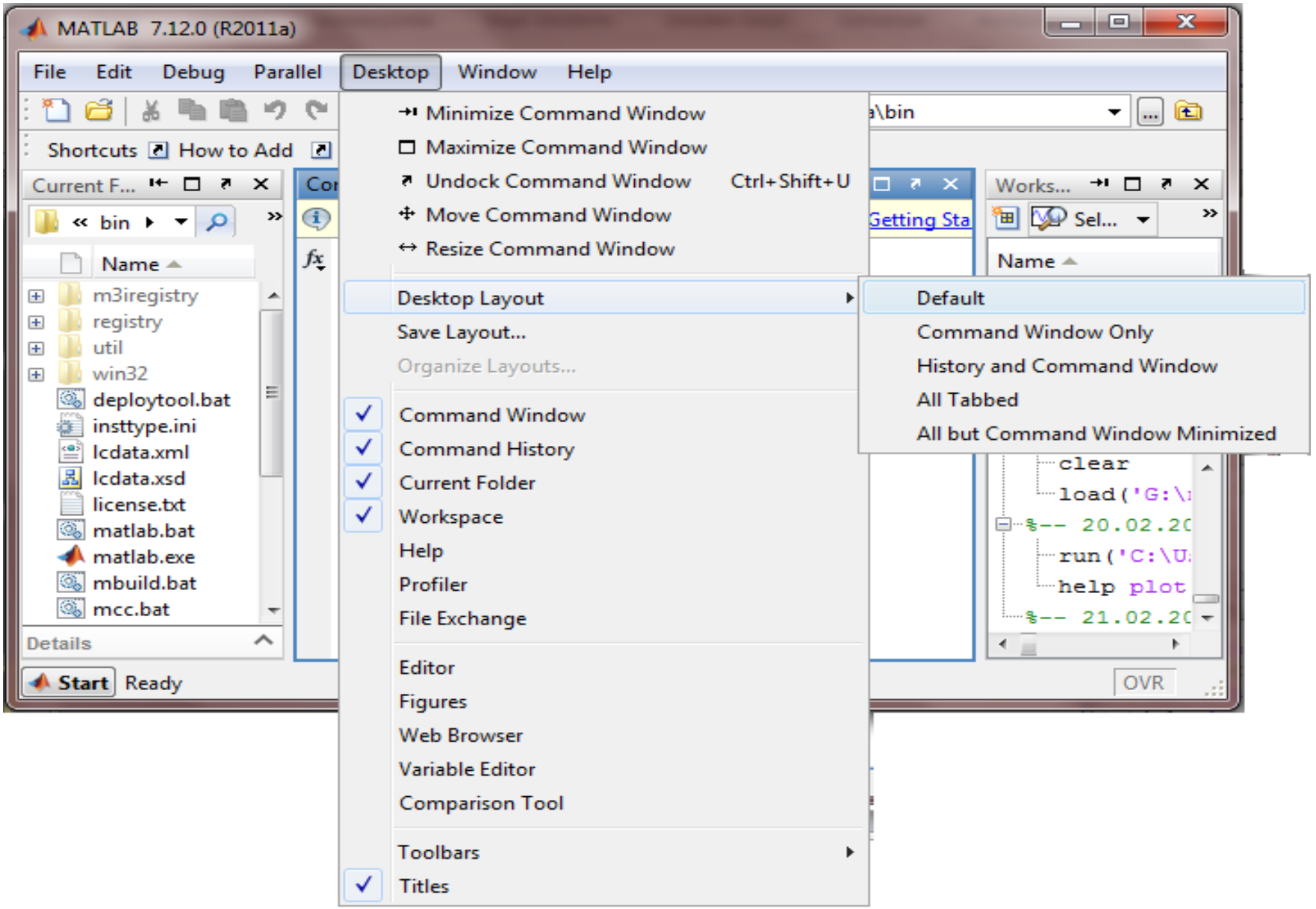
MATLAB

- MATrix LABoratory
- Widely used in universities and colleges
- Powerful environment for technical computing
- No need having prior experience in programming
- Based on Numerical analysis
- Symbolic calculations

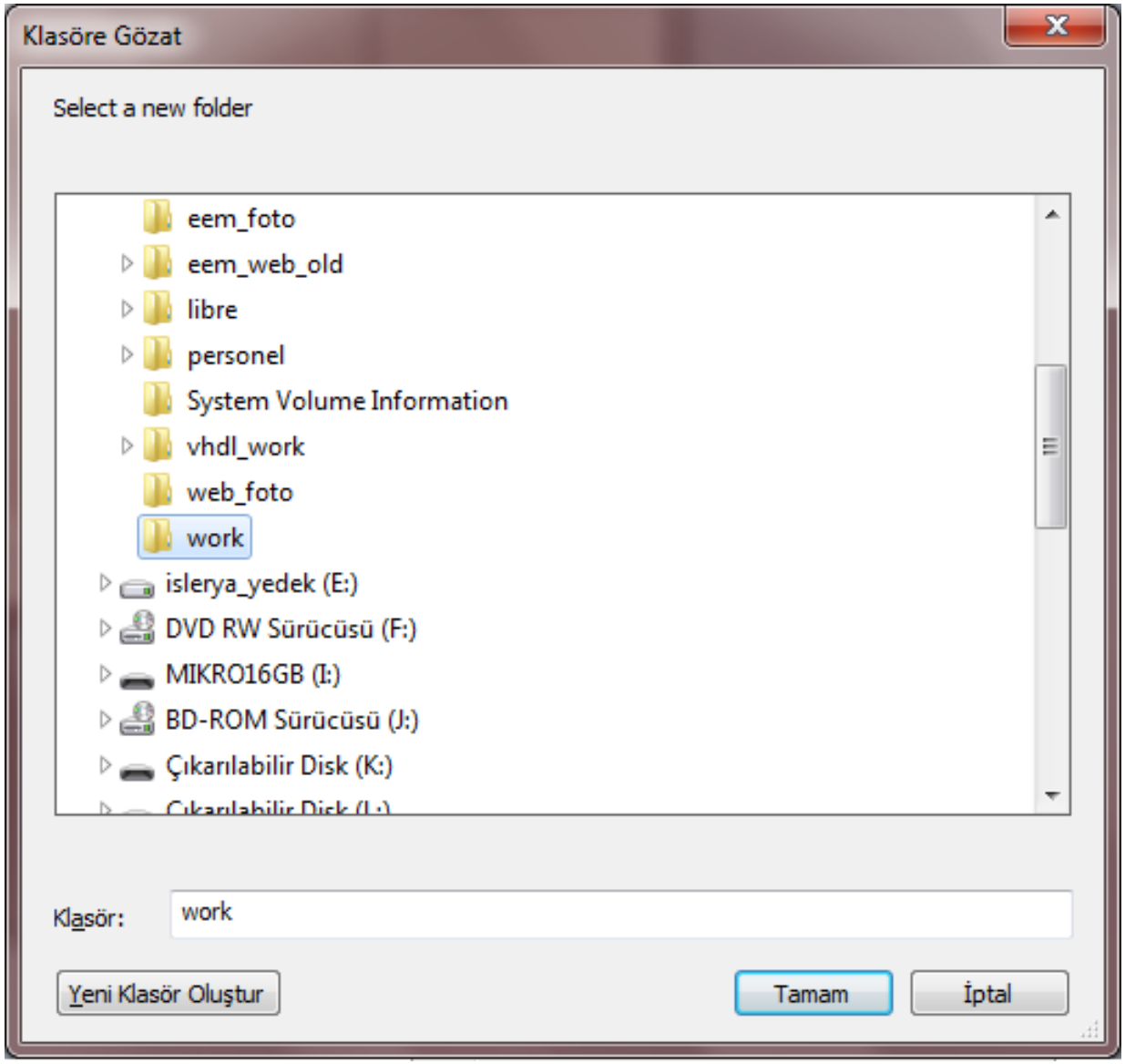
Starting MATLAB



Choosing Desktop Layout



Changing Current Folder



MATLAB Environment

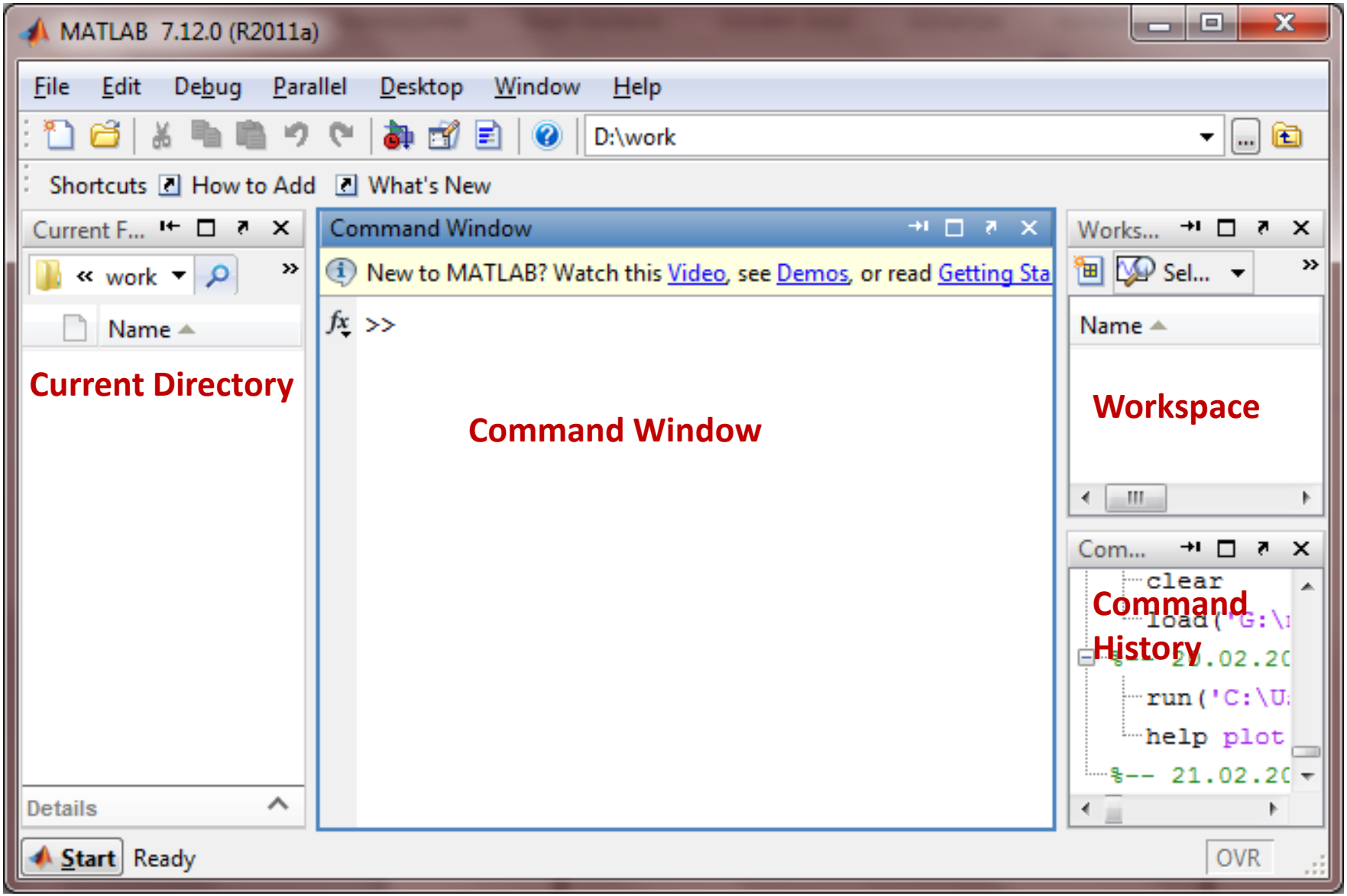
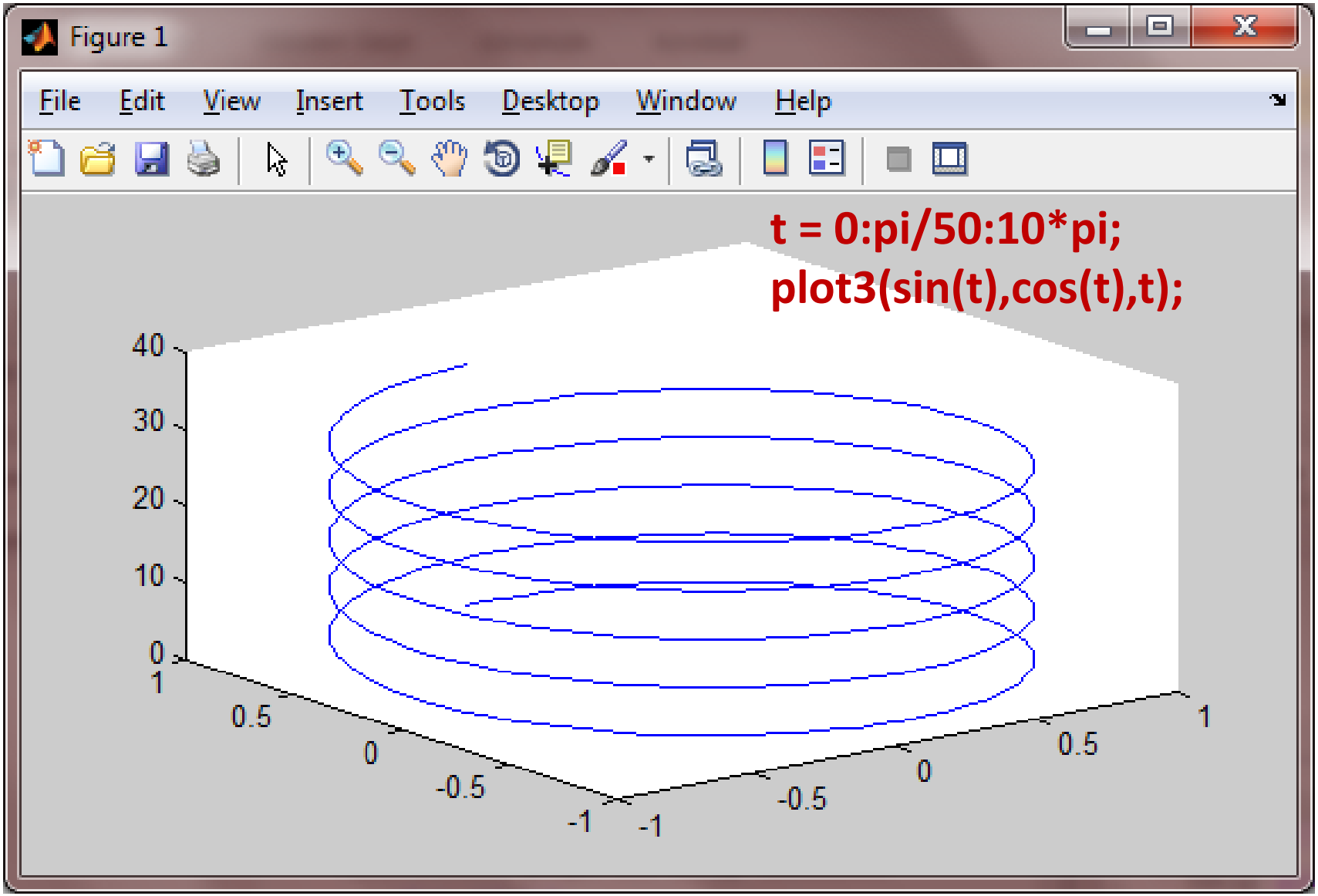
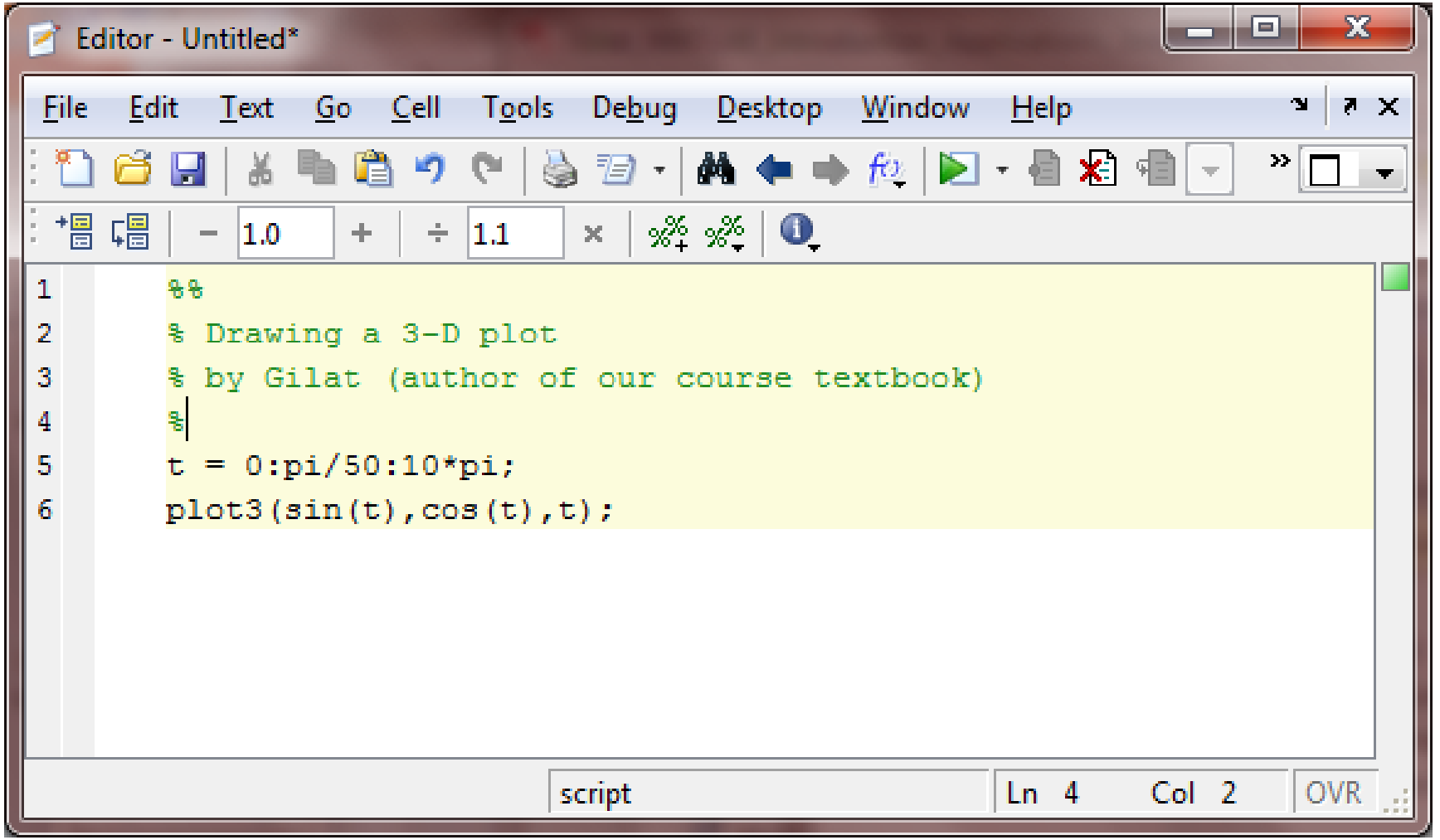


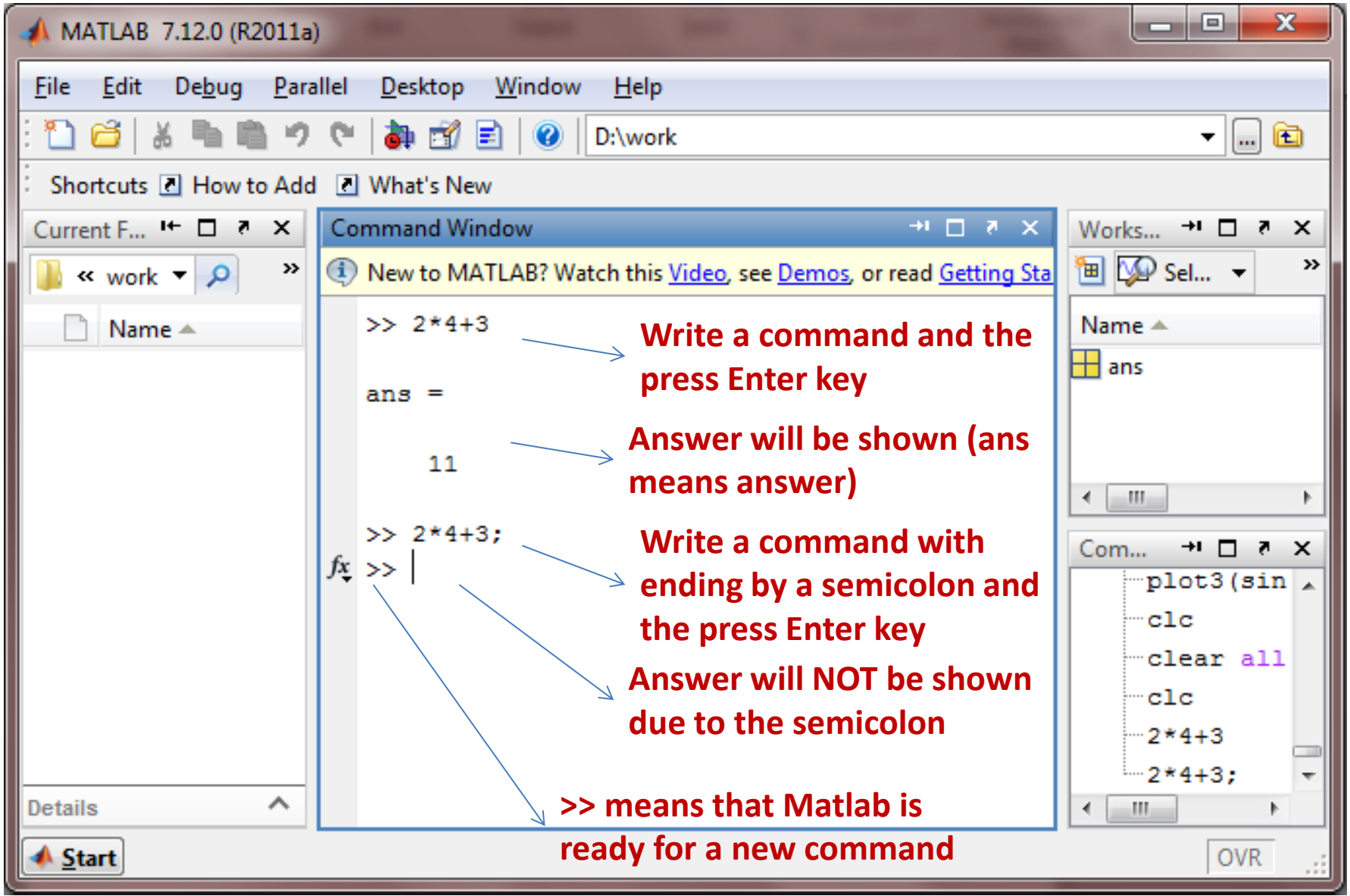
Figure Window



Editor Window



Working with Command Window



Running Command

- After running a command (writing the command, and pressing the Enter-key), you cannot change it. To correct the command, you should give a new correct command ☺
- A previous command can be seen, by pressing Up-Arrow key. Before pressing Enter key, you can move the cursor by using Left- and Right-Arrow keys, and then you can make changes.

Some Notes

- If a semicolon (;) is typed at the end of a command, the answer will not be shown, but the command will be executed, of course.
- No matter which command is written after the percent symbol (%), it will not be executed, which is called commenting.
- clc: Clear the command window

Arithmetic Operations

Operation	Symbol	Example
Addition	+	3+2
Subtraction	-	3-2
Multiplication	*	3*2
Division (right division)	/	3/2
Left division	\	3\2
Exponentiation	^	3^2

Precedence	Operation
1	( )
2	^
3	* / \
4	+ -

x \ y equals to y / x for scalars.

if precedences are equal, the left-side operation will be executed first.

Display formats

Try >> 290 / 7 after

Command	Description	The example output
format short	Fixed-point with 4-decimal digits between 0.001 and 1000, otherwise «long e» format.	41.4286
format long	Fixed-point with 14-decimal digits between 0.001 and 1000, otherwise «long e» format.	41.42857142857143
format short e	Scientific notation with 4 decimal digits	4.1429e+001
format long e	Scientific notation with 15 decimal digits	4.142857142857143e+001
format short g	Best of 5-digit fixed or floating points	41.429
format long g	Best of 15-digit fixed or floating points	41.4285714285714
format bank	Two decimal points	41.43
format compact	Eliminates empty lines	
format loose	Adds empty lines (opposite of compact)	

Elementary Functions

Function	Description	Example
sqrt(x)	Square root	sqrt(81)
nthroot(x,n)	Real n-th root of a real number x	nthroot(80,5)
exp(x)	e^x	exp(5)
abs(x)	Absolute value	abs(-24)
log(x)	Natural logarithm (base e = ln)	log(1000)
log10(x)	Base 10 logarithm	log10(1000)
factorial(x)	$x!$	factorial(5)

Trigonometric Functions

Function	Description
sin(x) sind(x) asin(x) asind(x)	Sine and inverse sine
cos(x) cosd(x) acos(x) acosd(x)	Cosine and inverse cosine
tan(x) tand(x) atan(x) atand(x)	Tangent and inverse tangent
cot(x) cotd(x) acot(x) acotd(x)	Cotangent and inverse cotangent
pi	π
Hyperbolic trigonometric functions are also present.	

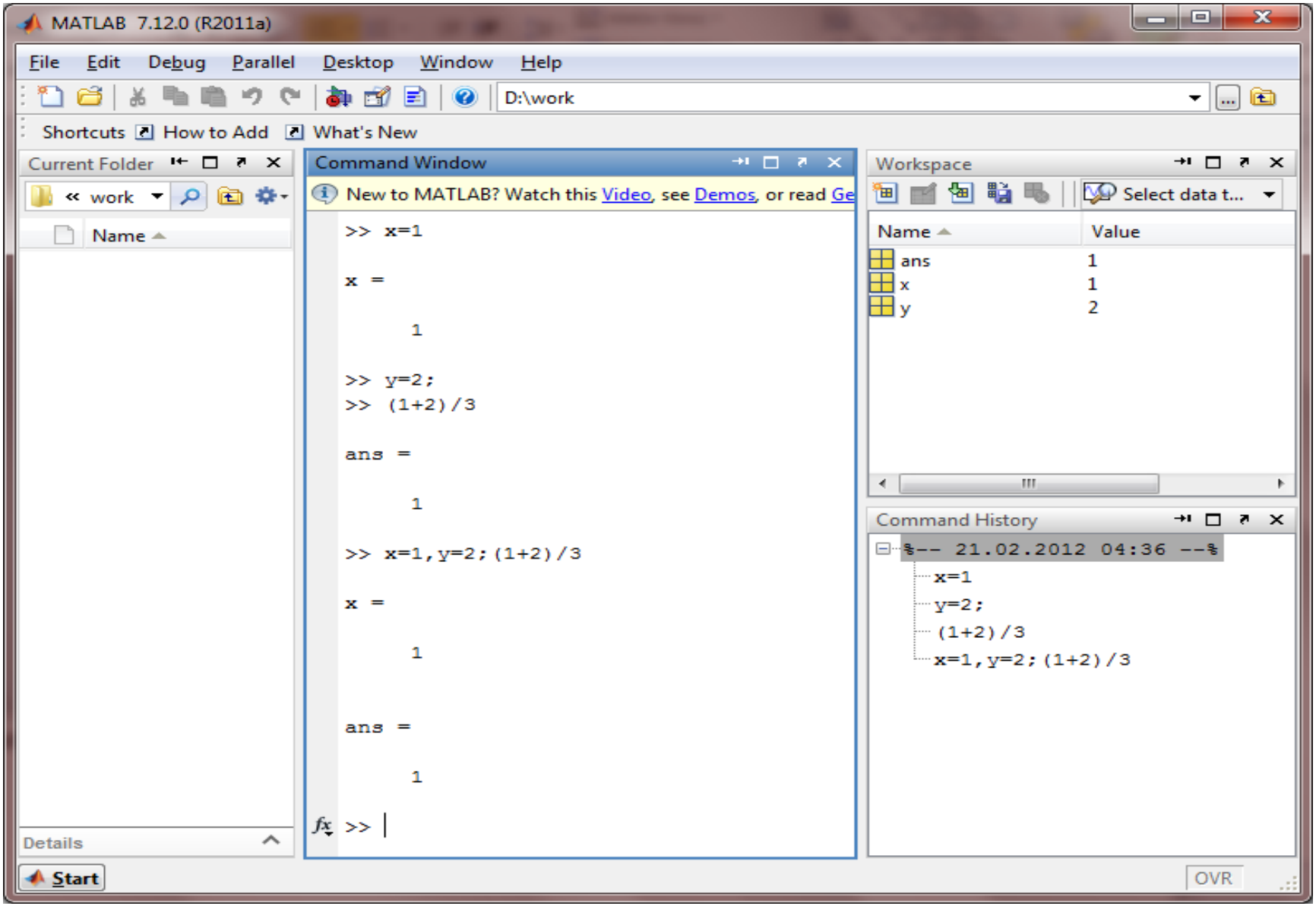
Rounding Functions

Function	Description	Example
round(x)	Rounds to the nearest integer	round(17/5) →3
fix(x)	Rounds towards zero	fix(13/5) →2
ceil(x)	Rounds towards infinity	ceil(11/5) →3
floor(x)	Rounds towards minus infinity	floor(-9/4) →-3
rem(x, y)	Returns the remainder after x is divided by y	rem(17,5) →2
sign(x)	Signum function, returns 1 if x>0, -1 if x<0, and 0 if x=0	sign(17) →1

Variables

- A variable, is a name made of a letter or a combination of several small and/or capital letters, digits, and underscore character (_), contains a numerical value.
- A variable name must begin with a letter (Turkish characters and spaces are NOT allowed)
- Case-sensitive: AA, Aa, aA, and aa are all different.
- Avoid using the names of built-in function. If you prefer giving a function name to a variable, you can use the variable but the function.
- Forbidden to use keywords: *break, case, catch, continue, else, elseif, end, for, function, global, if, otherwise, persistent, return, switch, try, while*

Assignment Operator



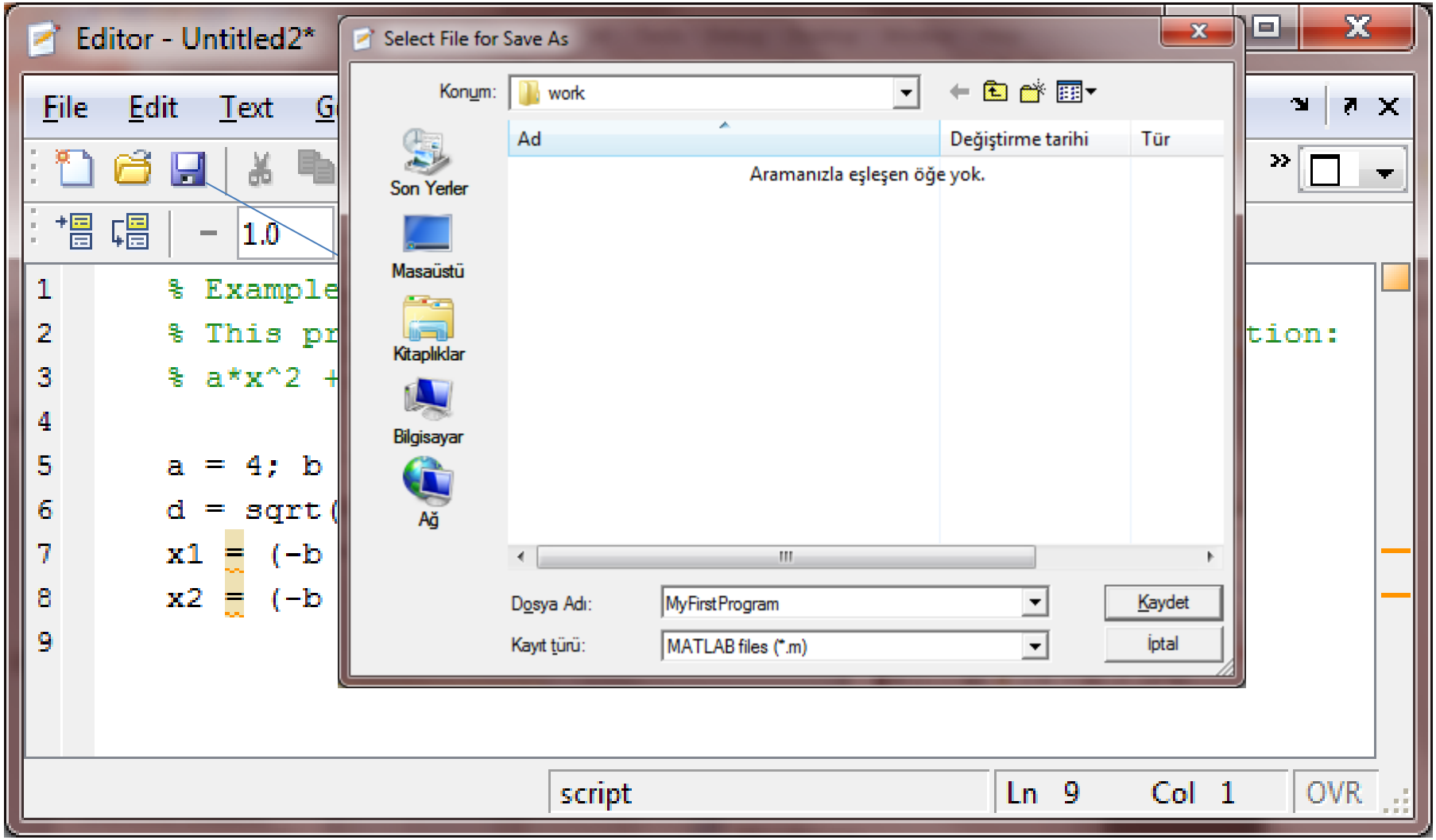
Predefined Variables

- ans: A variable that has the value of the last expression that was not assigned to a specific variable.
- pi: The number of π.
- eps: The smallest difference between two numbers that Matlab can recognize.
- inf: Used fo infinity.
- i: Defined as $\sqrt{-1}$ (to show imaginary part of complex numbers)
- j: Same as i.
- NaN: Not a Number (for example, 0/0).

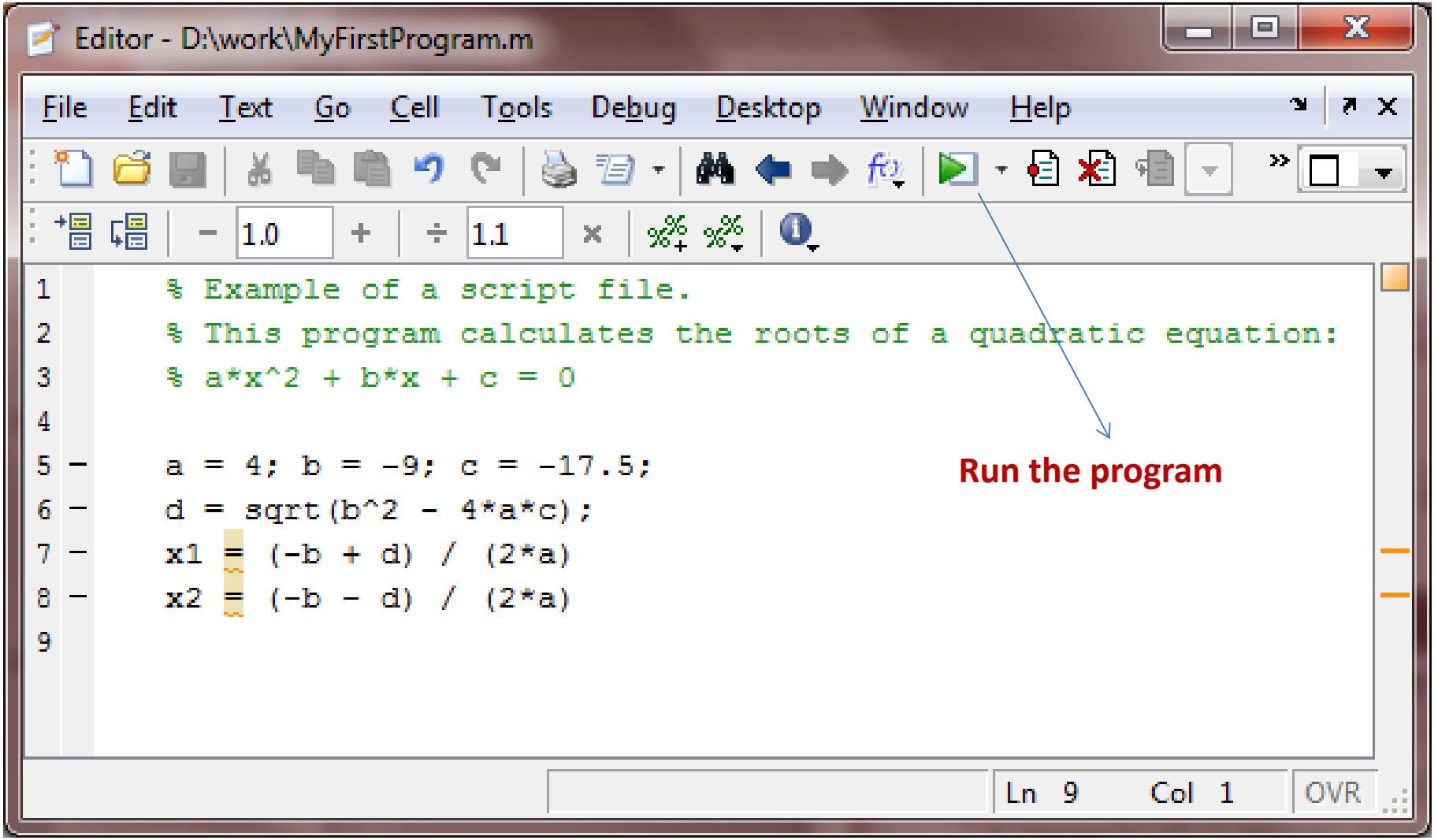
Script Files

- A script file is a sequence of MATLAB commands, also called a program during all remaining lecture sessions of this course.
- When a script file runs (is executed), MATLAB executes the commands in the order as if they are typed in the Command Window.
- Using a script file is convenient because it can be edited and executed many times even after turn off and turn on the computer.
- Script files can be typed and edited in any text editor (preferably Matlab Editor).
- Script files are also called M-files because the extension .m is used when they are saved.

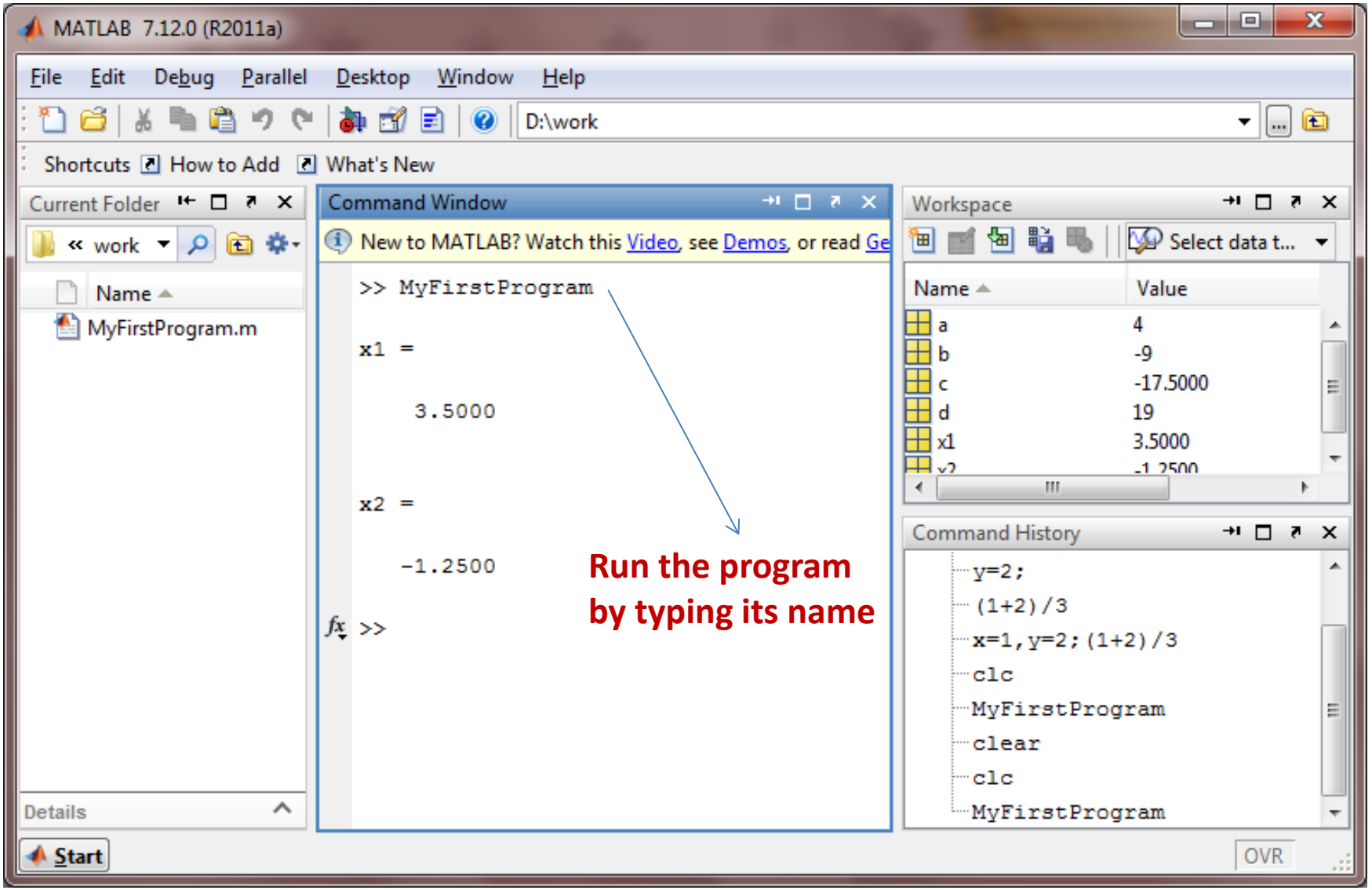
Creating and Saving a Script File



Running a Script File



Running an Already-Saved Script



Laboratory Session

Do sample applications in Chapter 1 of the textbook.

Homework #3

Not later than the next week:

Solve problems 3, 4, 7, 12, 13, 16, 19, 20, 25, and 26 from the Chapter 1 of the textbook using Matlab.