



Summer Training I MATLAB for Engineers



Benha University

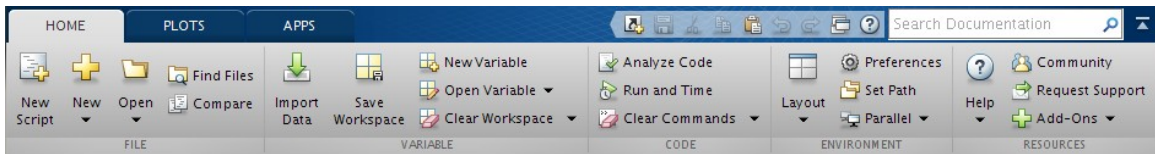
Computer Systems Engineering
Electrical Engineering Department

Faculty of Engineering
(at Shoubra)

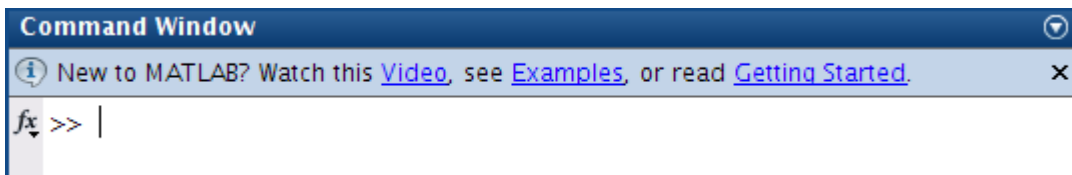
Lab 03

Getting Started

1. Start MATLAB
2. On the **HOME** tab, in the **ENVIRONMENT** section, click **Layout**, then **Default**.¹



3. Consider the **Command Window**.



Vectors

4. Ten students in a class take a test. The marks are out of 10. All the marks are entered in a MATLAB vector, marks. Write a statement to find and display the average mark.
Try it on the following: 5 8 0 10 3 8 5 7 9 4

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5. What are the values of x and a after the following statements have been executed?

```

a = 0; i = 1; x = 0;      a = _____0_____ x = _____0_____
a = a + i;               a = _____ x = _____
x = x + i / a;           a = _____ x = _____
a = a + i;               a = _____ x = _____
x = x + i / a;           a = _____ x = _____
a = a + i;               a = _____ x = _____
x = x + i / a;           a = _____ x = _____
a = a + i;               a = _____ x = _____
x = x + i / a;           a = _____ x = _____

```

¹ You may like to try other **Layout** options.



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Loops

6. Rewrite the statements in the previous exercise more economically by using a for loop. Can you do even better by vectorizing the code?

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7. Work out by hand the output of the following script for $n = 4$:

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n = input( 'Number of terms? ' );      k = 1, s = 0+1/1^2=1
s = 0;                                k = 2, s = _____
for k = 1:n                            k = 3, s = _____
s = s + 1 / (k ^ 2);                  k = 4, s = _____
end;                                   _____
disp(sqrt(6 * s))

```

8. If you run this script for larger and larger values of n , you will find that the output approaches a well-known limit. Can you figure out what it is? Now rewrite the script using vectors and array operations.

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Applications

9. The steady-state current I flowing in a circuit that contains a resistance $R = 5$, capacitance $C = 10$, and inductance $L = 4$ in series is given by

$$I = \frac{E}{\sqrt{R^2 + (2\pi\omega L - \frac{1}{2\pi\omega C})^2}}$$

where $E = 2$ and $\omega = 2$ are the input voltage and angular frequency, respectively. Compute the value of I .

10. The electricity accounts of residents in a very small town are calculated as follows:
- If 500 units or fewer are used, the cost is 2 cents per unit.
 - If more than 500 but not more than 1000 units are used, the cost is \$10 for the first 500 units and 5 cents for every unit in excess of 500.
 - If more than 1000 units are used, the cost is \$35 for the first 1000 units plus 10 cents for every unit in excess of 1000.
 - A basic service fee of \$5 is charged, no matter how much electricity is used.

Write a program that enters the following five consumptions into a vector and uses a for loop to calculate and display the total charge for each one: 200, 500, 700, 1000, 1500.



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11. A mortgage bond (loan) of amount L is obtained to buy a house. The interest rate r is 15%. The fixed monthly payment P that will pay off the bond loan over N years is given by the formula

$$P = \frac{rL(1 + r/12)^{12N}}{12[(1 + r/12)^{12N} - 1]}$$

- a) Write a program to compute and print P if $N = 20$ and the bond is for \$50,000. You should get \$658.39.
- b) See how P changes with N by running the program for different values of N (use input). Can you find a value for which the payment is less than \$625?
- c) Go back to $N = 20$ and examine the effect of different interest rates. You should see that raising the interest rate by 1% (0.01) increases the monthly payment by about \$37.
