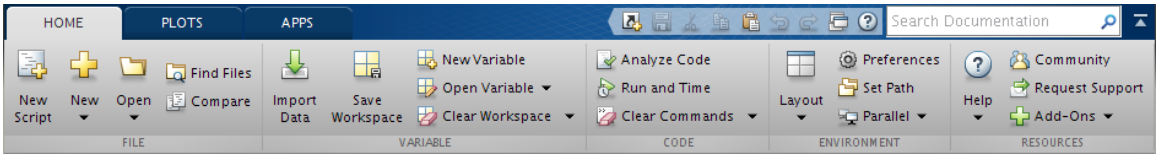
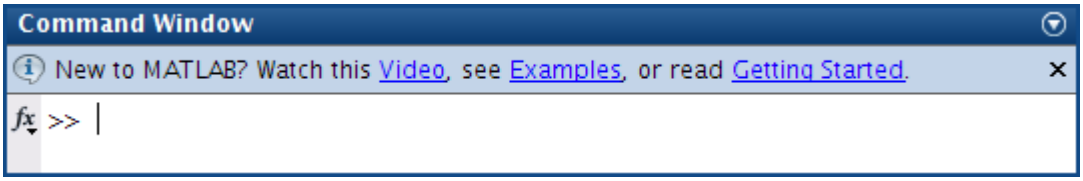
Lab 03

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`

```
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------


-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
```

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.

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?

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

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

```
k = 1, s = 0+1/1^2=1
k = 2, s = ____________________
k = 3, s = ____________________
k = 4, 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.

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.

11. A mortgage bond (loan) of amount `L` is obtained to buy a house. The interest rate `r` is15%.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.