MATLAB is a common and very powerful tool in science and engineering. The following link contains instruction on how to download and install MATLAB on your computer https://is.oregonstate.edu/service/software/matlab Let us start with some simple commands.

1. Start Matlab

2. Enter the following commands one by one

   1+2
   x=1+2
   x
   x;
   y=x^2+2*x+1/x;
   y

   What do you think the semicolon is used for?

3. To enter a row vector, simply type e.g.

   A = [1 2 -1 3]

   or

   A = [1,2,-1,3]

   To enter a column vector, use semicolon instead of space or comma

   B = [1;2;-1;3]

   Now try

   A(1)
   B(3)

   What do you get? You can see that the starting index of entries is 1 (not 0).

4. Try the following commands

   C = [1 2 3;4 5 6;7 8 9;10 11 12]
   size(C)
   transpose(C)
   C(1,:) 
   C(:,2)
   C(2,:) = C(2,:) - 4*C(1,:)

   What does each command do?

5. Try the following commands
x = 3:15
y = 3:2:15
z = 15:-3:3
length(y)
size(x)

What does each command do?

6. The following commands create special matrices.

ones(3)
zeros(2,5)
eye(4)
eye(2,4)
eye(4,2)

7. Let us discuss how to plot the graph of function \( y = x^2 + 2x - 3 \) on the interval \([-4,2]\). First, we discretize the interval \([-4,2]\) by sample points, say

\[
h = 1 \\
x = -4:h:2 \\
\]

After this command, we see that \( x \) is a row vector of sample points with spacing \( h = 1 \). We want to compute \( y \) at each point. This is done by the command

\[
y = x.^2 + 2*x - 3 \\
\]

Note that the dot in \( x.^2 \) is to tell Matlab that we want to square each entry of \( x \). In other words, we want to square component by component. Without the dot, Matlab will interpret \( x^2 \) as \( x \times x \) (multiplying row \( x \) by itself), which does not make sense. Now \( y \) is a row vector of the same length as \( x \). Each point \((x(1), y(1)), (x(2), y(2)),...\) belongs to the graph. A rough rendition of the graph is obtained by connecting these points by straight line segments. This is done by the command

\[
plot(x,y) \\
\]

To get a more exact graph, one should decrease the spacing size, for example choose \( h = 0.1 \). You can use arrow keys (Up or Down) to recall and edit previous commands.

\[
h = 0.1 \\
x = -4:h:2 \\
y = x.^2 + 2*x - 3 \\
plot(x,y) \\
\]

8. Now try

\[
x \\
y \\
clear x y \\
x \\
y \\
\]

What does the command “clear” do? To erase the command window, type

\[
clc \\
\]