# Exercise Set, Introduction to Matlab

1. Give the Matlab command (using the colon operator) to create the following array:

$$4.5 \quad 4.0 \quad 3.5 \quad 3.0 \quad \ldots \quad 1.5$$

2. What does the following do?

```
x=[1 2 3 4 5];
y=2.^x;
z=x.*x;
```

3. Given the array:
$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 5 & 1 & 2 & 3 & 4 \\ 4 & 5 & 1 & 2 & 3 \\ 3 & 4 & 5 & 1 & 2 \\ 2 & 3 & 4 & 5 & 1 \end{bmatrix}$$

   (a) How do I multiply everything in $A$ by 2, then subtract 3 from every entry (in Matlab)?

   (b) What is the shortest Matlab command to get a subarray using the following elements:
   $$B = \begin{bmatrix} A(1,2) & A(1,3) & A(1,4) \\ A(3,1) & A(3,2) & A(3,3) \end{bmatrix}$$

   (c) In Matlab, show that $B^T B$ is a symmetric matrix. Compare to $B^2$ and the matrix formed by squaring each element of $B$ (if these are defined).

   (d) What is the Matlab command to remove the even-numbered columns of $A$?

   (e) In Matlab, what does `A-eye(5)` do?

4. How do I create an array that has 4 rows, 6 columns, and is filled with random numbers between 0 and 1?

5. Watch the 4 minute video "Working in the Development Environment" on the Matlab channel in YouTube (Google it). Then answer the following questions:

   (a) What are two different ways of saving the variables in the workspace?

   (b) How do you load the variables back into Matlab?

6. Watch the 6 minute video "Writing a Matlab Program" in the same playlist.

   (a) What is a "script"? How do you run a script?

(b) Write the script that is given in the example, `simple0.m` (Note the zero to distinguish it from the next step).

(c) Write the function that is given in the example, and save it as `simple.m`

7. After viewing the previous video, determine what Matlab does if you type the following:

```
a=1.5; b=3.6;
for k=1:100
   h(k)=(b-a)*rand+a;
end
```

(Hint: What is the biggest and smallest possible number in the vector $h$?)

8. Write a script file that will construct a vector $x$ consisting of 225 evenly spaced points in the interval $[-4, 8]$, then proceeds to plot $\sin(x)$ in red, $\sin(2x)$ in black, and $\sin(3x)$ in green, all on the same plot.

9. When we compute with numbers, we might run into some difficulty if the numbers become too large or undefined. Some examples:

- `eps` is the distance from 1 to the next largest number. That is, Matlab will see something like `1+eps/2` as the same as 1.

- `NaN` means "Not a Number"- Happens if you do something like 1/0, and `Inf` means that the expression is infinitely large.

Here are some fun things to try in Matlab- Tell me what happens in each case:

(a) `eps` (This is scientific notation), `1-(1+eps/2)`

(b) `1/0`, `-1/0` and `0/0`

(c) `1/Inf`

(d) `Inf+Inf`, and `Inf-Inf`

(e) `Inf/Inf` and `Inf/0`