Matlab Exercises

Part 1

version 7.1, EJP, 2019

1. Start matlab.

2. Enter the following

   1 + 2
   x = 1 + 2
   x = 1 + 2;
   y = x^2 + 2*x + 8

3. Enter the following

   format longE
   pi

You can use the arrow keys and the delete key to recall and edit previous commands. Press the up arrow key twice to recall the format command and delete the "**e**" and press enter. Then display **pi** again. Repeat with the following formats.

   format shortE
   format short

4. Enter the following

   a = pi/6
   sin(a)^2 + cos(a)^2
   exp(2*log(3) + 3*log(2))

5. Enter the following

   a = [1 2 3]
   b = [4 5 6]
   Z = a + i*b

i here is the square root of -1.
You can use **j** instead if that is what you are use to.

6. Display the real and imaginary parts of **Z** and the conjugate of **Z**.

7. Display the angle and magnitude and of **Z**.

magnitude => norm(Z)

8. Try the following.

   Z'
   Z.'

9. Enter the following matrix

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

10. Try the following and ensure you can follow what is happening.

```
B = A + 4
A + B
A - B
A * B
A^2
A'
```

11. Solve the simultaneous equation on page 15 of the notes. **A** should already be present from exercise 10.

```
b = [ 5 ; 11 ]
x = A \ b
```

Now check that **x** is the correct solution.

```
A * x
```

12. It is just as easy to solve a hundred simultaneous equations in a hundred variables. First create a 100 by 100 matrix of random numbers.

```
A1 = rand(100);
```

If you forget to put in the semicolon, 10,000 numbers will be printed out.

Next create a column vector with 100 numbers

```
b = (1:100)'
```

Now solve

```
x = A1 \ b
```

Check that the solution is correct.

```
A1 * x
```

Part 2

1. You should have the two matrices

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \qquad B = A + 5$$

from exercise 10 in part 1.
If not, then enter them again.

2. Now try the following array operations.

```
A .* B
A ./ B
A .^ B
sin(A * pi/6)
D = A.^2
sqrt(D)
```

Clear the workspace of all variables.

```
clear
```

3. Plot the polynomial $2x^3 - x$

```
x = linspace(-1,1,100);
y = 2*x.^3 -x;
```

What happens if you don't include the dot ?

```
plot(x,y)
```

Don't close the figure containing the plot.

4. Plot the polynomial $2x^3 - x$ using the function polyval. First find out how to use polyval using the help.

```
doc  polyval
```

```
p = [4 0 -3 0]
y1 = polyval(p,x);
```

```
hold on
plot(x,y1,'g')
```

5. There are many functions that handle polynomials. Look them up in the help. Enter **doc polyval** again, then click on **Functions** on the blue banner at the top of the window.

What does the function **roots** do?

6. Plot the roots of the polynomial onto the graph.

```
r = roots(p)
ry = zeros(3,1)
```

The plot should still be held from exercise 4.

```
plot(r,ry,'rx')
```

Clear the figure

```
clf
```

7. Enter the following.

a = 2: 0.5 : 4

a(2)
a([2 4])
a(2:4)
a(2:end)

8. Enter the following

w = (1:5)' * (5:10)

This produce a 5 by 6 matrix that we can use in the next exercise.

Set the third element on the second row of **w** to **100**.

9. Enter the following

w(2:4,2:4)
w(2,:)
w(:,5)
w([1 5],[2,4])
w(:)
w(:) = 1:30

10. By now you should have a nice collection of variables. Try

who
whos

If you cannot see the workspace window, click on the **HOME** tab and then click on **Layout** in the **ENVIROMENT** section and select **Three Column**.

Enter the following in the command window.

save
clear

All variables should have been saved to **matlab.mat** . If you can't see this in the **Current Folder** window, right click in the window and select refresh.

The workspace window should be empty. Double click on **matlab.mat** to restore all your variables.

11. Produce a script called **mygraph**.

edit mygraph

In **mygraph** enter

x = linspace(-2*pi,2*pi,100);
y = sin(x);
plot(x,y)
grid

Save by clicking on the icon and run by entering

mygraph

in the command window.

12. Add the following at the end of the script created above.

hold on
y1 = mysin(x);
plot(x,y1,'r:')
axis([-2*pi,2*pi,-2,2])

Click on the "Save and Run" icon