AMATH 301 – Autumn 2020

Homework 0 – Solutions

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Writeup problems

You should start a new MATLAB or python script for the writeup portion of the assignment.

1. The following code will create a straight line. Copy it into either MATLAB or python, save the plot, and add it to your writeup (**NOTE: You may not be able to copy and paste directly. Instead, just recreate this code**).

   MATLAB

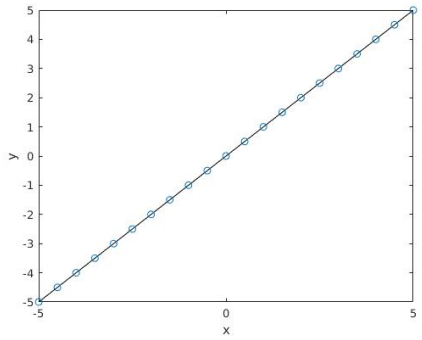
   ```
   x = [-5:0.5:5];
   y = x;
   plot(x,y,'k')
   hold on
   plot(x,y,'o')
   xlabel('x')
   ylabel('y')
   ```

   python

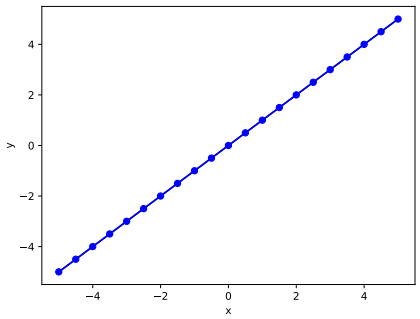
   ```
   import numpy as np
   import matplotlib.pyplot as plt
   x = np.arange(-5,5,0.5)
   y = x
   plt.plot(x,y,color='black')
   plt.plot(x,y,color='blue',marker='o')
   plt.xlabel('x')
   plt.ylabel('y')
   plt.show()
   ```

   Explain in your own words what the blue circles are in the plot.

   Solution: The code produces the following figure:



The figure found using MATLAB.



The figure found using python.

The blue circles are the data points that we have, they are the (x,y) points. The black line is the lines between those points, created by the software. This is like when you were in Pre Calculus and were making plots by first making a table and then drawing lines between points.

My code is below.

Problem 1 Code:

MATLAB

```
% Homework 0 Solutions

%% Problem 1
% Define the variables
x = [-5:0.5:5];
y = x;
plot(x, y, 'k')
hold on
plot(x, y, 'o')
xlabel('x')
ylabel('y')
```

python

```
# Homework 0 Solutions
import numpy as np
import matplotlib.pyplot as plt

# Problem 1
# Define the variables
x = np.arange(-5,5+0.5,0.5)
y = x
plt.plot(x, y, color='black')
```

```
plt.plot(x, y, color='blue', marker='o')
plt.xlabel('x')
plt.ylabel('y')
```

2. The following code will create a parabola. Copy this code into MATLAB or python, save the plot, and add it to your writeup. (**NOTE: You may not be able to copy and paste directly. Instead, just recreate this code**).

MATLAB

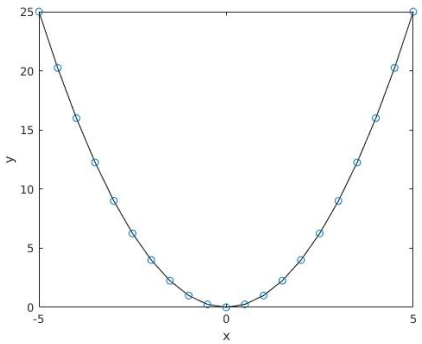
```
x = [-5:0.5:5];
y = x.^2;
plot(x,y,'k')
hold on
plot(x,y,'o')
xlabel('x')
ylabel('y')
```

python

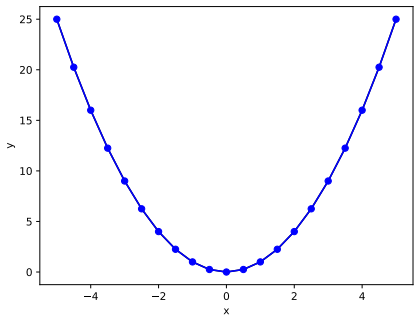
```
import numpy as np
import matplotlib.pyplot as plt
x = np.arange(-5, 5, 0.5)
y = x**2
plt.plot(x,y,color='black')
plt.plot(x,y,marker='o', color='blue')
plt.xlabel('x')
plt.ylabel('y')
```

Explain in your own words what the `.^` (in MATLAB) or the `**` (in python) commands do.

Solution: The code produces the following figure:



The figure found using MATLAB



The figure found using python.

The command squares all of the elements of the vector/array x. We will talk more about this later!

My code is below.

Problem 1 Code:

MATLAB

```
%% Problem 2
x = [-5:0.5:5];
y = x.^2;
plot(x, y, 'k')
hold on
plot(x, y, 'o')
xlabel('x')
ylabel('y')
```

python

```
# Problem 2
x = np.arange(-5, 5+0.5, 0.5)
y = x**2
plt.plot(x, y, color='black')
plt.plot(x, y, color='blue', marker='o')
plt.xlabel('x')
plt.ylabel('y')
plt.show()
```