Name: _____
Date:: _____
Algebra & Trigonometry
Computer Programming Worksheet 1
Graphing Polynomials in Python with Numpy and Matplotlib

Exercise 0
Begin with configuring the Python environment to run the seed script ('makePlot00.py')
Perform the following changes:
1) Come up with new axis labels and a figure title
2) Reduce the number of points that are computed for plotting
3)Try variation of the plot annotation, things like

```
plt.plot(x, y,'k.')
plt.plot(x, y,'r--')
```

...more details can be found by Googling "*matplotlib tutorial*"

Print this plot to hand in

Exercise 1
Now change the seed-script formula to instead calculate a quadratic with roots at $x=-2$ and $x=+3$.
1) Plot this and print out to show the curve does indeed cross the x-axis at those two roots
2) What is the minimum value of this quadratic, and where does this occur?
2a) 1st evaluate this polynomial at a high mesh density: 1000 points or more...
2b) use the minimum function to find the value and index of this minimum

```
yMinimum = y.min(0)
indexMinimum = y.argmax(0)
xMininimum = x[indexMinimum]
```

Exercise 2

Now change the script to compute a cubic polynomial with "double root" at $x = -2$ and a "single root" at $x = +3$

1) multiply (by hand) that polynomial into the form $y = ax^3 + bx^2 + cx + d$

2) evaluate that in Python using the formula `y = a*x^3 + b*x^2 + c*x + d` and plot.

2a) Show those two expressions are numerically the same.

3) What happens when that double root is split into distinct roots $x = -2.5$ and $x = -1.5$? Plot and show.

Exercise 3

Now take the cubic polynomial, displace it up-or-down by an offset, and plot

In Python, this would be:

```
y1 = y + h
plt.plot(x, y1)
```

Take the cubic polynomial and displace it left-or-right by a change in x variable. Plot.

In Python, this would be:

```
x0 = np.arange(-3, 3, 0.2)
x = x0 + h
```