# ENGR 1120 - 800 Spring 2020

# Lab 5: Array Operations - Graphing Math Functions

**Overview :**

You have been working with arrays (1-D) to store groups of numbers. Now we will learn to use the some basic array operations in MATLAB. These are known as the *element-wise* operations. Keep in mind, these are very different than the typical mathematical operators that you are familiar with.

**Scalar Operations :**

All of the math we have done so far has been *Scalar Arithmetic*. This means that each operand was a Scalar (1x1) and each numerical expression was evaluated as a Scalar (1x1).

```
x=10*2          --> 20
y=x*5           --> 100
A=[10, 15, 12, 13]
p=A(1)*A(3)          --> 120
```

**Element-Wise Operations :**

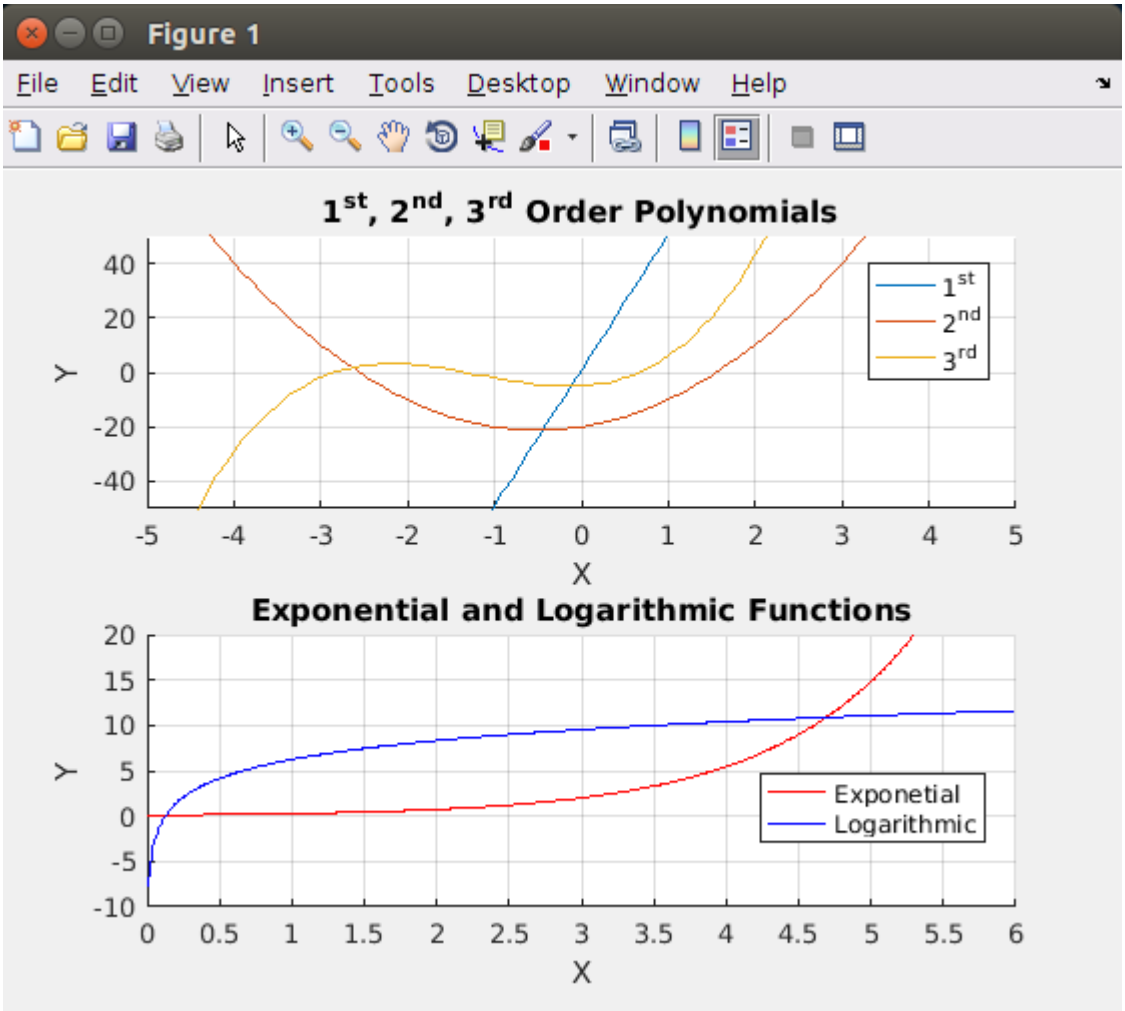
It is often useful to operate on an entire array at once. Today we will learn 3 new operations for 1D arrays. These operate on the array operands one element at time and generate a array that is the same size and shape as the array operand.

- Element Wise Multiply `.*`
- Element Wise Divide `./`
- Element Wise Power `.^`

```
A=[10, 15, 12, 13]
B=[1, 5, 2, 3]
C=A.*B          --> 10, 75, 24, 39
C=A./B          -->10.0, 3.0, 6.0, 4.3
C=A.^B          --> 10, 759375, 144 , 2197
```

## The Curves :

- First Order Polynomial - $y = mx + b$
- Second Order Polynomial - $y = Ax^2 + Bx + C$
- Third Order Polynomial - $y = Dx^3 + Ex^2 + Fx + G$
- Exponential - $y = H \times e^{Ix}$
- Logarithmic - $y = J \times ln(Kx)$



**Assignment : You are going to write a program to graph the curves shown on the previous page. Your curves do not have to be exactly like mine, but I need to able to identify them.**

1. Initialize an array to represent your *Independent Variable*. You can see the needed range on the figures shown below. Make sure to use an increment that is small enough to make your curves smooth.

2. Compute the dependent values (y -values) for each curve. Make sure to use the *element-wise* operators when you need them and regular operators when you don't.

3. Graph the first, second and, third order polynomials together on figure 1. Each needs it's own line type and color.

4. Graph the exponential and logarithmic curves together on figure 2. Each needs it's own line type color.

5. Set the axis of your graphs to ones shown in the example figures.

6. Experiment to find coefficient values that make your figures look similar to mine. They do not have to be perfect.

7. Add a title and a legend to both figures.

8. Show both figures in a *Subplot*.

9. Bonus: Show the *roots of the polynomials* on figure 1 as visible points with markers.