ETGG1801	Lab 7: **Functions**	Points: **50**
Assigned: **11/1/2017**	Due: **11/10/2017 @ 8am** (Friday)	

1. Read the "Lab Notes" sections, even if not attempting a lab that uses it (I might throw in a quiz question on it!)
2. Pick some combination of the following problems to complete to make the minimum points. If you go over this, it's bonus points!
3. For Problems 1 – 3, use the provided main function (only deviate from it if you ask Jason first and get approval).
4. Problem #1: **Bubble-Web** (https://youtu.be/D-MeIp1TZAs) [**25 points**]
   a. From the main program, infer all functions necessary in the bubble_web.py module (you *can* add other functions if you choose) – ask if you need a hint on how they work…
   b. Docstrings on all functions.
5. Problem #2: **Polynomial-Visualizer** (https://youtu.be/mudphApsG2s) [**25 points**]
   a. From the main program, infer all functions necessary in the my_math_main.py module (you *can* add other functions if you choose) – ask if you need a hint on how they work…
   b. Docstrings on all functions.
6. Problem #3: **Recursive Quads** (https://youtu.be/--y_9p2uevA) [**25 points**]
   a. There should only be one function in this module, but it's a recursive function, which makes everyone brain hurt…
7. Problem #4: **Re-do Lab6 using functions** (**up to 25 points, depending on effectiveness**):
   a. (Use your lab6 solution or mine as a starting point)
   b. Make at least 3 modules (player, lance, and ball, for example) and move all creation, update, and draw functions into those modules.

Lab Notes:

1. Change of scale
   a. Suppose we have two different scales we're measuring things by. For example,
      i. Pixels: the values range from pmin to pmax
      ii. Foo: the values range from fmin to fmax
   b. For example:

   c. How do we convert some arbitrary foo amount (e.g. 5.9) to pixel scale or vice-versa?
2. Minimal amounts of calculus for people that haven't taken MATH2110.
   a. A polynomial function is of the form:

$$f(x) = 5x^5 - 20x^4 + 5x^3 + 50x^2 - 20x - 40$$

   b. If you supply a value of x, the function will tell you the corresponding y-value.
      i. For example, if x is 2.5 in the above function, we'd get:

$$f(2.5) = 5(2.5)^5 - 20(2.5)^4 + 5(2.5)^3 + 50(2.5)^2 - 20(2.5) - 40$$
$$= 5(97.65625) - 20(39.0625) + 5(15.625) + 50(6.25) - 20(2.5) - 40$$
$$= -617.34375$$

   c. To mechanically calculate the derivative of a function, take the power x is being raised to, multiply it by the coefficient, and subtract one from the power. Any constant term (like -40) won't appear in the derivative. For our example, the derivative is:

$$25x^4 - 80x^3 + 15x^2 + 100x - 20$$