**MAE 3403** **Fall 2022** **Homework 1**

Due at 11:59 pm, Friday, September 2nd, in the Canvas Homework 1 Assignment Dropbox

Write a single Python program (.py) file that fulfills all of the requirements given below. You will upload that single Python file to the Canvas Homework 1 Assignment Dropbox. You will name that file: ***Firstname_Lastname_CWID.py***, using your actual name and student ID (CWID).

The description below requires that you write four different functions that perform four unrelated tasks. All four functions and the function named main(), used to call and test the four functions, must be placed in that single Python file.

You will test your functions using the particular numerical values (integers, floats or arrays) given in the main() function below. When we grade your assignment, we will run your program with those given numerical values, looking for correct answers. Then we might change the numerical values (including changing the SIZES of the arrays) and look for correct answers. We will only use numerical values and array sizes that make sense. We will not be testing your program to see how it handles bad data.

In this assignment, you must use variables, loops, if statements, your own function definitions and function calls to write the required functions. **For now, you *may not use* any of the powerful functions available in python modules.**

You must use comments in your functions, to describe the purpose of your lines of code

a) Write a function defined as: def ArraySumOdd(vals):
   vals: an array (list) containing integers or floats
   return value: the sum of all the odd values in the array. Negative values can be odd.
   Note: Use Google to learn how to detect Even or Odd in python

b) Write a function defined as: def MatrixProductLargerThan(A, val):
   A: a FULL matrix (list of lists) containing integers or floats
   val: a float or integer.
   return value: the product of the terms in the matrix that are larger that val.
   Note: for this function, 2 is larger than -5, -3 is larger than -4, etc

c) Write a function defined as: def polyval(x, coeffs):
   x: a float
   coeffs: an array containing the coefficients of a polynomial, in order from the coefficient of the lowest power to the coefficient of the highest power.
   return value: the value of the polynomial for the given value of x

$$P(x) = a_0 + a_1 * x + a_2 * x^2 + a_3 * x^3 + a_4 * x^4$$

   Note: Use Google to learn how to raise a number to a Power in Python.

d) Write a function defined as: def location_of_largest(amatrix):
   amatrix: a full matrix of floats and integers
   return value: the location (row and column numbers) of the largest ***magnitude*** value (largest absolute value) in amatrix
   Note: Use Google to learn how to determine the absolute value.

e) Type and call this main() function to test the four functions defined above. When you upload your program to the dropbox, it must include this main() with these values.

```
def main():
    # define the variables needed to test the required functions
    myvals = [-1,5,2,-3,5,5,3,-5,2,5,3,3,1,5]
    mymatrix1 = [[1, 3.7, -7, 4],
                 [-8, 9, 2, -1.8],
                 [-12, 7.9, 3.2, 13]
                 ]
    mymatrix2 = [[1, 3.7, -7],
                 [-8, 9, -1.8],
                 [7.9, 3.2, -11],
                 [4.3, -0.32, 4]
                 ]

    p1 = [3,   1, -2, -4]
    p2 = [2, 1.4,  1, -1, 2]

    x1 = 1.3
    x2 = -2.4

    # for part a)
    ans1 = ArraySumOdd(myvals)
    ans2 = ArraySumOdd(p1)
    print('part a)  ',ans1, ans2)
    print()  # print a blank line

    # for part b)
    ans1 = MatrixProductLargerThan(mymatrix1, x1)
    ans2 = MatrixProductLargerThan(mymatrix2, -1.5)
    print('part b)  ',ans1, ans2)
    print()  # print a blank line

    # for part c)
    poly = polyval(x1, p1)
    print('part c)  Polynomial value for (x1= {:.2f}) = {:.1f}'.format(x1, poly))
    poly = polyval(x2, p2)
    print('part c)  Polynomial value for (x2= {:.2f}) = {:.1f}'.format(x2, poly))
    print()  # print a blank line

    # for part d)
    row, col = location_of_largest(mymatrix1)
    val = mymatrix1[row][col]
    print('part d) ',val,row,col  )
    row, col = location_of_largest(mymatrix2)
    val = mymatrix2[row][col]
    print('part d) ',val,row,col  )


main()
```

***The printed answers are:***

```
part a)   26 4

part b)   87549.69600000003 -4633.399296000001

part c)  Polynomial value for (x1= 1.30) = -7.9
part c)  Polynomial value for (x2= -2.40) = 84.6

part d)  13 2 3
part d)  -11 2 2
```