**HOMEWORK 3 – Operator Overloading (Intermediate Classes)**

Answer the following questions. **THIS ASSIGNMENT WILL BE DUE AT A DATE TO BE ANNOUNCED IN CLASS.**  (100 points)

1. Design a class named Complex that contains as data items the real part “a” and imaginary part “b” of a complex number a + bi. (Both a and b are any real number.) Then overload the following operators as follows:

* The + operator (i.e., method \_\_add\_\_) to add two complex numbers;
* The – operator (i.e., method \_\_sub\_\_) to subtract two numbers;
* The \* operator (i.e., method \_\_mul\_\_) to multiply two complex numbers;
* The / operator (i.e., method \_\_truediv\_\_) to divide two complex numbers;
* The len operator (i.e., method \_\_le\_\_) to find the magnitude of a complex number;
* The > operator (i.e., method \_\_gt\_\_) to determine if one complex number is greater than (i.e., has a larger magnitude) than another;
* The < operator (i.e., method \_\_lt\_\_) to determine if one complex number is less than (i.e., has a smaller magnitude) than another;

Please note that the first four overloaded operations should produce a third complex number; the fifth overloaded operation produces a float value; and the last two should produce a Boolean value.

You decide how to handle the input process (i.e., in main or in the body of the class), as well as how to output the results.

import math

class Complex:

def \_\_init\_\_(self, a, b):

self.a = a

self.b = b

def \_\_repr\_\_(self):

return f'{self.a} + {self.b}i'

def \_\_add\_\_(self, other):

return Complex(self.a + other.a, self.b + other.b)

def \_\_sub\_\_(self, other):

return Complex(self.a - other.a, self.b - other.b)

def \_\_mul\_\_(self, other):

return Complex(self.a \* other.a - self.b \* other.b, self.a \* other.b + self.b \* other.a)

def \_\_truediv\_\_(self, other):

divisor = other.a \*\* 2 + other.b \*\* 2

return Complex((self.a \* other.a + self.b \* other.b) / divisor, (self.b \* other.a - self.a \* other.b) / divisor)

def \_\_le\_\_(self):

return math.sqrt(self.a \*\* 2 + self.b \*\* 2)

def \_\_gt\_\_(self, other):

return self.\_\_le\_\_() > other.\_\_le\_\_()

def \_\_lt\_\_(self, other):

return self.\_\_le\_\_() < other.\_\_le\_\_()

def main():

a1 = float(input("Enter real part of first complex number: "))

b1 = float(input("Enter imaginary part of first complex number: "))

c1 = Complex(a1, b1)

a2 = float(input("Enter real part of second complex number: "))

b2 = float(input("Enter imaginary part of second complex number: "))

c2 = Complex(a2, b2)

print("Sum:", c1 + c2)

print("Difference:", c1 - c2)

print("Product:", c1 \* c2)

print("Quotient:", c1 / c2)

print("Magnitude of c1:", c1.\_\_le\_\_())

print("Magnitude of c2:", c2.\_\_le\_\_())

print("c1 > c2:", c1 > c2)

print("c1 < c2:", c1 < c2)

if \_\_name\_\_ == "\_\_main\_\_":

Complex.main()