Computer Programming (2)
ECE 214C

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Sheet 5

Problem 1: *Quadratic Equation*

Create a class `Quadratic` for manipulating quadratic equarions. A quadratic equation is a 2nd degree polynomial:

$$f(x) = \sum_{i=0}^{2} a_i x^i$$

Based on the previous sheet, create a class `Quadratic` that extends the class `Polynomial`, an interface `Root`, a class `RealRoot` that implements the interface `Root`, and a class `ComplexRoot` that extends the class `Complex` and implements the interface `Root`.

1. Provide a constructor for the class `Quadratic` that takes three `double` parameters to initialize the quadratic equation paramters by calling the superclass (`Polynomial`) constructor.
2. Provide a method `roots` that returns a `Root` array containing the roots of $f(x)$.
3. Provide a method `solution` that returns a formatted string representing the roots of $f(x)$.

Write a program to test the classes.

1. Create a quadratic equation `q1` and initialize its parameters with three arbitrary numbers.
2. Print the quadratic equation f.
3. Print f', f'', f'''.
4. Print the roots of the quadratic equation

Example: Assuming that the quadratic equation parameters are $\{1, 2, 2\}$, the program should print:

```
f(x) = 1.00 + 2.00x + 2.00x^2
f'(x) = 2.00 + 4.00x
f''(x) = 4.00
f'''(x) = 0.00
f(x) = 0 @ x1 = -1.00 + 1.00i, x2 = -1.00 - 1.00i
```