



### **Description of Components and Responsibilities**

**Scalar**: Interface Scalar has 2 different scalar types (Rational Scalar for Rational number, and Real Scalar for Real number).

**Rational Scalar and Real Scalar** implement **Scalar** methods. In each type of scalar, we can add, multiply, and power between two **same** types of scalar.

In order to know the difference between those two scalars and approach to their methods, we used Visitor Pattern Design, and therefore we avoid using instance of and casting in their methods.

The Visitor Pattern Design has one interface called **ScalarVisitor**. Its implementation class (**ScalarVisitorImp**) has 4 methods that their input/output are in all combinations of Scalar types (Rational and Real).

Therefore, if one of the scalar types visits the visitor, then by the signature it will know to which method to enter and return its instance to the scalars type class.

**Monomial**: Every monomial is built from 1 scalar (Rational or Real) and an exponent integer (non-negative). Each monomial can add, and multiply with other monomial if and only if they have the same scalar type therefore it has a method that checks that. Also, a monomial could evaluate with a given scalar and derivate itself.

**Polynomial**: In this assignment there are 2 types of polynomials (Rational or Real). Each polynomial is built from  $0 - \infty$  monomials. A polynomial could add, multiply with other polynomial if and only if they are having the same monomial types (Rational monomial / Real monomial – depends on their scalar type). Also, a polynomial could evaluate and derivate itself.