Programming Project

A polynomial such as:

\[ f(x) = 7.4x^5 + 3.1x^2 - 10.2x + 14.9 \]

can be represented as a linked list in which every node corresponds to a term in the polynomial. Each term's coefficient and degree are stored as fields in the corresponding node. The polynomial above, for example, can be represented by a list:

![Linked List Representation](image)

We assume that there is at most one element for any given degree and that the elements are ordered so that the highest degree comes first.

Implement a class, Polynomial, that describes such a polynomial. It must supply the following methods:

A constructor that builds a polynomial with no terms.

A method to parse a string into a polynomial. The string is a series of number pairs. The first item in each pair is the coefficient, and the second is the degree. The elements of the pair are comma-separated. The pair are separated by one or more blanks. To input the polynomial above, the input string would be “7.4,5  3.1,2  -10.2,1  14.9,0”

A method to evaluate a polynomial (calculate its value) for a given value of x.

A method to return a string representation of the polynomial, for example:

\[ 7.4 \times x^5 + 3.1 \times x^2 - 10.2 \times x + 14.9 \]

A method to find the derivative of a polynomial.

A method to find the sum of two polynomials.

Hint: You will want to create a class that represents a term.
Write a JUnit test class to test the methods of Polynomial.

Write a console user interface that provides a simple menu system for interacting with the Polynomial class. (Omit the “sum” function).

Polynomial Driver
1. Enter a polynomial.
2. Evaluate the polynomial.
3. Find the derivative.
4. Display the polynomial.
?
1
Enter the terms of the polynomial:
2,4 7,1 -3,0
1. Enter a polynomial.
2. Evaluate the polynomial.
3. Find the derivative.
4. Display the polynomial.
?
2
Enter the value of x:
2
The polynomial value is 43.
1. Enter a polynomial.
2. Evaluate the polynomial.
3. Find the derivative.
4. Display the polynomial.
?
4
2 \times X^4 + 7 \times X - 3
1. Enter a polynomial.
2. Evaluate the polynomial.
3. Find the derivative.
4. Display the polynomial.
?
3
8 \times X^3 + 7
1. Enter a polynomial.
2. Evaluate the polynomial.
3. Find the derivative.
4. Display the polynomial.
?