

Project 4: Polynomial Calculator

CSC 1351, Spring 2006

Due: 6 May 2006

Design and implement a calculator for univariate polynomials as described in Project 20.1 on page 771 in the textbook.

Implement a polynomial as a sorted linked list in which only the terms with non-zero coefficients are stored. Each term in the list contains a coefficient and an exponent. The terms are sorted in decreasing exponent order. The constant zero needs special treatment, e.g., it could be represented as the empty list.

Implement the following operations: addition, subtraction, multiplication, and derivative.

To simplify parsing, read a polynomial as a parenthesized list of coefficients separated by commas. Allow arbitrary white space around coefficients. E.g., the polynomial $5x^{10} + 9x^7 - x - 10$ would be read in as

(5, 0, 0, 9, 0, 0, 0, 0, 0, -1, -10)

Parse the polynomial recursively, where you read the first coefficient and then recursively parse the rest of the polynomial. By constructing the list for representing the polynomial on the way back out of the recursion, you can avoid building list nodes for zero coefficients.

Your program should read expressions of the following forms from `System.in`:

polynomial + *polynomial*
polynomial - *polynomial*
polynomial * *polynomial*
d *polynomial*

where operation d is the derivative and where each *polynomial* is represented as a parenthesized list of coefficients as described above.

Print the result of each operation on `System.out` in the familiar polynomial form using x as the polynomial variable and ^ as the exponentiation operator. E.g., the above polynomial would be printed as follows:

$5x^{10} + 9x^7 - x - 10$

Administrative Stuff

Put your files in the directory `~/prog5` in your `cs1351xx` account on `byte` and submit it using

`~cs1351c/bin/r_copy 5`

Your main program should be in class `main.Main`. Keep the polynomial data structure in a separate package. Also submit a `README` file in which you briefly describe how you designed your code whatever else you want the grader to know.