

Assignment 4 – Polynomial

Date assigned: Wednesday, March 31, 2010

Date due: Monday, April 12, 2010

Points: 45

In mathematics, a polynomial is the sum of terms of the form \mathbf{ax}^e where \mathbf{a} is the coefficient, \mathbf{x} is a variable, and \mathbf{e} is an exponent. An example of a polynomial might be: $5.3x^2 + 2.0x^1 + 5x^0$. A univariate polynomial has a single variable used throughout the entire polynomial such as x used in the previous example. The degree of a polynomial is the largest exponent of all of the terms.

For this assignment, you are to use everything you've learned thus far in this course to create the mathematical concept of a polynomial in C++. The exponents of the polynomial are to be of type integer whereas the coefficients of the polynomial are to be double. There can be at most 50 terms in each polynomial object. You are to create a class called Polynomial with the definition stored in a file called "Polynomial.h" and the implementation in a file called "Polynomial.cpp". Create and use other classes in the creation of a polynomial as you see fit.

The methods and overloaded operators of your class Polynomial must be:

degree	prints the degree of the polynomial
operator>>	reads a polynomial in from the keyboard of the form: $n\ e_1\ c_1\ e_2\ c_2\ e_3\ c_3\ \dots\ e_n\ c_n$, where e_i represents an exponent and c_i represents a coefficient and n gives the number of terms in the polynomial. Each input value is separated by one or more whitespace characters
operator<<	prints a polynomial in the form: $5.00X^3 + 3.00X^2 - 15.00X^1$
operator+	is an overloaded binary operator that adds two polynomials
operator-	is an overloaded binary operator that subtracts two polynomials
evaluate	evaluates a polynomial for a given value of X

How you decide to implement your polynomial class is up to you, but the following program segment must produce the desired result:

```
Polynomial cPoly1, cPoly2, cPoly3;
....
cout << "Enter polynomial 1: ";
cin >> cPoly1;
cout << "Enter polynomial 2: ";
cin >> cPoly2;
cout << cPoly1.degree() << endl;
cout << cPoly1 << endl;
cPoly3 = cPoly1 + cPoly2;
cout << cPoly3 << endl;
cPoly3 = cPoly1 - cPoly2;
cout << cPoly3 << endl;
cout << cPoly1.evaluate(2) << endl;
```

Input data:

```
1 5 2
2 5 3 2 1
```

would produce the following output for the above program segment:

```
5
2.00X^5
5.00X^5 + 1.00X^2
-1.00X^5 - 1.00X^2
64.00
```

Goals for Assignment 4:

1. Get experience in designing your own classes.
2. Use the C++ coding standards with your object-oriented code.
3. Use the .h/.cpp separate file design for defining and implementing classes.
4. Implement at most one constructor or method at a time and make sure to extensively test the constructor or method before going on. I promise you that on this assignment if you write too much code you will have extreme difficulties getting the code to compile and run.

Notes:

1. For the output of floating point numbers, use two significant decimal places for each double output.
2. All polynomials will be entered from highest exponent to lowest exponent value.
3. Save your project as 04PUNetID fully and correctly documented.
4. Your code is to be written using Visual Studio 2008 and placed in the CS250 Drop Box by 9:15am on the day in which the assignment is due. A stapled hard copy must be placed on the instructor's desk before 9:15am on the day the assignment is due for the entire project to be considered on time. Remember, print main.cpp, and the .h/.cpp related files for each class.
5. If you come to me with a question regarding your solution and I need to look at your code, I will either grab your code off of Turing or a jump drive. I will not look at your code on your computer as it just takes me too long to get at the problem. Further, I want you to bring in your textbook and lecture notes in case I want you to look up something. Remember, I'm not just a tell you the answer guy.
6. If you want help with a compiler error, you must be able to tell me exactly what statement you put in your code that caused the error and be able to isolate the error. If you have typed in a bunch of code and have not tested your code as you've gone along, I'm not going to help you sort out the mess. You've been warned!!