CS250 Assignment 3
Polynomial ADT

Date Assigned: Monday, March 14, 2005
Date Due: Friday, April 1, 2005
Points: 35

In mathematics, a polynomial is the sum of terms of the form ax^e where a is the coefficient, x is a variable, and 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 devise an abstract data type (ADT) that will store the coefficient and exponent for each term in the polynomial. The exponents of the polynomial are to be of type integer whereas the coefficients of the polynomial are to be real but easily modifiable. There can be at most 50 terms in each polynomial object. Your class interface must be saved in a file called "poly.h", and the class definition in the file "poly.cpp".

The member functions of your class polynomial must be able to:
1. print the degree of the polynomial.
2. read a polynomial in from the keyboard of the form: n e1 c1 e2 c2 e3 c3 ... en cn, where ei represents the exponents and ci represents the coefficients and n gives the number of terms in the polynomial. Overload the extraction operator >> for reading.
3. print a polynomial in the form: 5.00X^3 + 3.00X^2 - 15.00X^1 using the overloaded output operator <<.
4. add two polynomials using the overloaded operator binary +.
5. subtract two polynomials using the overloaded operator binary -.
6. evaluate a polynomial for a given integer value of X.

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

```
Polynomial p,q,r;
cin >> p;
cin >> q;
cout << p.degree () << endl;
cout << p << endl;
r = p + q;
cout << r << endl;
r = p - q;
cout << r << endl;
cout << p.eval (2) << endl;
```

The input data:

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

must 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
```

Notes:
- You MUST follow the coding standards.
- For the output of floating point numbers, use two significant decimal places for each float output.
- All polynomials will be entered from highest exponent to lowest exponent value.

How to submit:
- Submit a hard copy of the code by 9am on the day the assignment is due.
- Place the complete project folder in the CS250 drop folder on Turing by 9am on the day the assignment is due.