Assignment #4

ECS 40 - Introduction to Software Development
Fall Quarter, 2013

Due Date: Tuesday, October 29, 2013, 11:59PM

The Problem

This problem requires one to develop a "complete" class. We will focus on polynomials, and develop a class that enables us to do all operations with polynomials. The actual work will be to develop two classes, since polynomials are made up of monomial terms. Thus...

Develop a class of monomials and polynomials. Monomials are of the form

\[ cx^n \]

where c is a constant, and n is a non-negative integer. Polynomials are sums of monomial terms, for example

\[ p(x) = 3x^4 - 2x^2 - x + 1 \]

Insure that all operations that can be done with monomials and polynomials appear in the classes, including:

Addition,
Subtraction,
Negation,
Multiplications --
  Multiplication of two monomials,
  Multiplication by a monomial term,
  Multiplication by a scalar,
  Multiplication of two polynomials
+=, -=, *=,
output,
comparison,
evaluation by a specific value of x,
and others.
The polynomial class can be implemented as an array of monomial terms (assume that no polynomial has more than 20 terms). Note that the output function must conform to the "usual" conventions, for example that terms are printed in decreasing order of the monomial exponents, that \(x^1\) appears as \(x\) and \(x^0\) does not appear, that terms with a zero coefficient \(c\) do not appear, or that the signs of the constant terms appear between the monomial terms (but a positive sign can't appear for the first term).

Write a program that tests all operations of the polynomial class. (Verify each result by doing it two ways.) Make sure that "like" terms are combined in the output, and exhibit that this feature is working.

Using your polynomial class,

- construct the polynomial \(p(x)\) as a product of the four polynomials

\[
p(x) = 4(x^3 + x^2)(6x + 1)(\frac{1}{100}x^{10} - 2x^5)
\]

- print the resulting polynomial,

- Calculate the result of \(p(x)\) when \(x = 0, x = 0.01, x = 0.02, \ldots, x = 1.0\)

**Late Policy**

Assignments are graded on a 50-point basis. A five-point penalty will be assessed for each late day (weekends count as one day). **The assignment must be complete when turned in, or it will be given a score of zero, and returned to the student.** Assignments must be turned in electronically with a Makefile and README (which identifies the student)

...and, of course, Have Fun!