# PIC 10B SPRING 2013 HOMEWORK 4

**Assignment**

Modify your existing `Polynomial` and `Rational` classes from HW2 to use operator overloading of the stream operators << and >>.

*Because the focus of this assignment is on operator overloading and File I/O, if you were unable to properly implement the print function previously please use the following lines of code instead and NO points will be deducted:*

```
for(int i=0; i<coefficient.size(); i++)
    out<<"+"<<coefficient[i]<<"x^"<<i;
```

Start with the code from HW2. Here is a brief description of *new* functions to include:

- <<: `ostream` × `Polynomial` → `ostream`
- >>: `istream` × `Polynomial` → `istream`
- <<: `ostream` × `Rational` → `ostream`
- >>: `istream` × `Rational` → `istream`

Your program should accept the coefficients from the user as before, using cin, only now that code should be run when the >> operator is invoked on a Polynomial or Rational object; make the >> operator *quiet*, in the sense that it *only* prompts the user for coefficients and does not itself print anything to the console. Also, now instead of outputting the results to the console, your program should output the results to a file in the local directory named "[First Name][Last Name]hw4Output.txt", so for example my file would be called StephenDeSalvohw4Output.txt.

Note: You may find yourself attempting to access private variables in the non-member operator definitions. Feel free to include additional member functions as needed in order for the functions and operators listed on the homework to function properly.

Place your code in a source file labeled *hw4.cpp*. ***If your file is not named this exactly, your homework will not be collected***. As with all programs in this course, your code should contain useful comments. In particular, your name, the date, and a brief description of what the program does should appear at the top of your source file.

**What to Turn in**

Place in your Submit folder the source file *hw4.cpp* with exactly this name (all lowercase, no spaces). The files will be automatically collected on Friday 4/26/13 at 5:00pm.

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*Date*: April 18, 2013.

| Grading | | |
|---|---|---|
| Operators | All operators defined and used correctly | 5 points |
| Output File | Correctly creates a text file with the appropriate values | 5 points |
| Solution | Code is efficient but easy to follow | 5 points |
| Style | Variable names, comments, indentation | 5 points |
| | TOTAL | 20 points |

Note on grading: There is an automatic 5 point penalty for any homework that does not compile.

A *sample* of output is below. NOTE! The values input are just an example. When grading the homework the grader will select values to input for the coefficients, so do not just hard-code these coefficients. It is sufficient to use cin and cout for this assignment, there is no need to use getline().

```
Welcome! Please input the coefficients of the first polynomial, p.
When you are finished, enter -123456789.
1
-2
0
4
-123456789

Your first polynomial is p(x) = 1-2x+4x^3.

Please input the coefficients of the second polynomial, q.
0
-1
5
0
0
0
-3
-123456789

Your second polynomial is q(x) = -x+5x^2-3x^6.

Please enter coefficients for the numerator and denominator, separated by -123456789.
1
1
-1
-123456789
5
-3
0
0
1
-123456789
Your rational function is r(x) = 1+x-x^2 / 5-3x+x^4.
Creating file ... Done.
Press any key to continue...
```

Your text file should look like the following, or much less pretty (but still needs to be accurate) if you had to use the simple code at the beginning of this document:

```
p(x) = 1-2x+4x^3.
q(x) = -x+5x^2-3x^6.
r(x) = 1+x-x^2 / 5-3x+x^4.

p(x)+q(x) = 1-3x+5x^2+4x^3-3x^6
p(x)-q(x) = 1-x-5x^2+4x^3+3x^6
p(x)*q(x) = -x+7x^2-10x^3-4x^4+20x^5-3x^6+6x^7-12x^9
p(x)/q(x) = 1-2x+4x^3 / -x+5x^2-3x^6

r(x)*p(x) = 1-x-3x^2+6x^3+4x^4-4x^5 / 5-3x+x^4
r(x)/q(x) = 1+x-x^2 / -5x+28x^2-15x^3-x^5-10x^6+9x^7-3x^10
r(x)*p(x)/q(x) = 1-x-3x^2+6x^3+4x^4-4x^5 / -5x+28x^2-15x^3-x^5-10x^6+9x^7-3x^10
```