EGRE 347 Applied Object Oriented Programming
Homework #3 – C++ Operator Overloading

<u>This homework must be your own (individual) work as defined in the course syllabus and discussed in class.</u>

Using your Matrix class implementation from homework #2, add overloaded operators for the assignment operator (=), matrix addition (+), matrix subtraction (-), matrix multiplication (*) and matrix division (/). Also include a multiplication operator (*) for multiplying a matrix by a scalar double quantity.

For output, implement an insertion operator (<<) for printing the matrix out using cout. The cout insertion operator output for the Matrix should result in exactly the same output as the print() method. For file IO, implement an insertion operator (<<) for printing the matrix out to a file, and an extraction operator (>>) for reading a matrix in from a file. The input file format should look like this:

        -10.0   20.0
        -30.0   40.0
.

A main program to test your implementation of the Matrix class is provided in the *main.cpp* file. You must define the Matrix class in a header file called *matrix.h* and implement the Matrix class methods in a separate *matrix.cpp* file. You must make your Matrix class implementation comply with the interface used in the *main.cpp* file and **you are not permitted to change the *main.cpp* file in any way**. When you run the main program in the *main.cpp* file, the output must look like that shown below:

```
        x matrix is:
                ---                     ---
                |       0.0000  0.0000   |
                |                        |
                |       0.0000  0.0000   |
                ---                     ---

        y matrix is:
                ---                     ---
                |       1.000   2.000    |
                |                        |
                |       3.000   4.000    |
                ---                     ---

        x = y
        x matrix now is:
                ---                     ---
                |       1.000   2.000    |
                |                        |
                |       3.000   4.000    |
                ---                     ---
        x matrix is:
                ---                     ---
                |       1.000   2.000    |
                |                        |
```

```
              |        8.000    7.000      |
              ---                        ---

y matrix is:
              ---                        ---
              |        5.000    4.000      |
              |                            |
              |        4.000    5.000      |
              ---                        ---

z = x + y matrix is:
              ---                        ---
              |        6.000    6.000      |
              |                            |
              |        12.00    12.00      |
              ---                        ---

z matrix is:
              ---                        ---
              |        6.000    6.000      |
              |                            |
              |        12.00    12.00      |
              ---                        ---

y matrix is:
              ---                        ---
              |        5.000    4.000      |
              |                            |
              |        4.000    5.000      |
              ---                        ---

x = z - y matrix is:
              ---                        ---
              |        1.000    2.000      |
              |                            |
              |        8.000    7.000      |
              ---                        ---

x matrix is:
              ---                        ---
              |        30.00    50.00      |
              |                            |
              |        25.00    40.00      |
              ---                        ---

y matrix is:
              ---                        ---
              |        2.000    3.000      |
              |                            |
              |        1.000    1.000      |
              ---                        ---

z = x * y matrix is:
              ---                        ---
              |        110.0    140.0      |
              |                            |
              |        90.00    115.0      |
              ---                        ---

z matrix is:
              ---                        ---
              |        110.0    140.0      |
              |                            |
```

```
                    |       90.00    115.0    |
                   ---                        ---

         y matrix is:
                   ---                        ---
                    |       2.000    3.000    |
                    |                         |
                    |       1.000    1.000    |
                   ---                        ---

         x = z / y matrix is:
                   ---                        ---
                    |       30.00    50.00    |
                    |                         |
                    |       25.00    40.00    |
                   ---                        ---

         y matrix is:
                   ---                        ---
                    |       2.000    3.000    |
                    |                         |
                    |       1.000    1.000    |
                   ---                        ---

         x = 2.0 * y matrix is:
                   ---                        ---
                    |       4.000    6.000    |
                    |                         |
                    |       2.000    2.000    |
                   ---                        ---

         Read w matrix from << argv[1]
         w matrix is:
                   ---                        ---
                    |      -10.00    20.00    |
                    |                         |
                    |      -30.00    40.00    |
                   ---                        ---
```

The output file for this example should look like this:

```
        -20.0   40.0
        -60.0   80.0
```

For this assignment, you must turn in a git bundle file (hw3.bundle) with all of your source files and a working Makefile to compile your solution. The Makefile should compile the solution in C++ with no errors or warnings. Turn in your assignment by attaching the git bundle file to the assignment submission page.

Remember the class policy on late submissions – no late submissions are allowed unless prior arrangement is made with the instructor.