EGRE 246 Advanced Engineering Programming Using C++
Homework #6 – C++ Operator Overloading

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

Using your Matrix class implementation from homework #5, 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
```

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A main program to test your implementation of the Matrix class operators is provided in the hw6.cpp file. You must define the Matrix class in a header file called hw6.h and implement the Matrix class methods in a separate .cpp file. You must make your Matrix class implementation comply with the interface used in the hw6.cpp file and **you are not permitted to change the hw6.cpp file in any way**. When you run the main program in the hw6.cpp file with the input file shown above, the output on the screen 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 homework, submit a zip file with your class definition in hw6.h, your class implementation in a separate .cpp file, and the original hw6.cpp file. Be sure to include a Makefile that compiles your solution.