CSCI335: Software Analysis and Design III

Project #1

Due Date: June 10th, 2025

Problem 1

Create a class for a dynamic(on the heap) 3 by 3 matrix(using arrays and not vectors) named `Matrix33`:

1. Make sure the private attribute is a **dynamically allocated** 2d array
2. Add a default constructor that takes no arguments and does nothing in the body:

   ```
   matrix33(){}
   ```

3. Make sure to separate the interface and implementation header + cpp
4. A constructor that accepts a 2d array as an input parameter
5. Write a copy constructor
6. Write a move constructor
7. Write a copy assignment
8. Write a move assignment
9. Overload * operator for matrix multiplication
10. Overload * operator for scalar multiplication
11. Overload + operator for matrix addition
12. Overload << operator to print matrix
13. Overload >> operator, and prompt user to enter 9 consecutive values
14. Write a function to compute the determinant of the matrix
15. For each of the functions above(number 3-14) tell me the big O run time and space time of your algorithm with an explanation.

Problem 2

- Given the Vector class in this directory, create a separate main.cpp file where you include the headers for `Matrix33` and `Vector3`
- Overload the operator (), for accessing the private attributes of the `Vector3` and `Matrix33` classes.

```
double operator()(int row, int col)
{
    return matrix[row][col];
}
```

- Write a function in main.cpp that takes a `Matrix33`=A and `Vector3`=x as input parameters and computes Ax=b, and returns a type of `Vector3`(b). What is the the big O runtime and time complexity of function? Explain.
- prompt the user to enter a matrix(3 by 3) and vector(3), then call your function to compute the product, then print the result.

Problem 3

Do problem 1, but for an n by m matrix using the vector template class(stl). In the constructor add the parameters for the number of rows (n) and number of columns(m).