**ECE 3822: Engineering Computation II**

**Homework No. 6: Command Line Compilation**

**Goal:** The goal of this homework is to demonstrate how to compile and link a program. We will use C/C++ for this exercise.

**Description:** The tasks are:

1. Create a function called add\_sin that takes two floating-point values as arguments and returns the sum of the sin of each value (using the sin function in math.h). Save it to a file called f\_01.cc.
2. Create a function called add\_sqrt that takes two floating-point values as arguments and returns the sum of the square root of each value. Save it to a file called f\_02.cc.
3. Create a main program that prints “hello world,” calls add\_sin and add\_sqrt, and prints the result. Save this to a file called f\_00.cc.
4. Compile and link these files into an executable called hw\_06.exe using -O2 optimization. Run it and demonstrate it gives the proper result.
5. Create a makefile and demonstrate that you can compile and link the program using a makefile. Follow the example provided in class and include all the same targets. Demonstrate the following: (a) delete the executable and show that the makefile only links the code; (b) delete f\_01.o and show that only f\_01.cc is recompiled; (c) touch f\_02.cc and demonstrate that only f\_02.cc is recompiled; (d) demonstrate that “make clean;make” produces the proper results.
6. Repeat this but compile using the debug flag so that you can run this code in a debugger. Using the debugger of your choice, set a break point where you call add\_sin and demonstrate that you can run the program and have it stop at this point. Also demonstrate that from this point you can step through the code and see the source code (and print variable values).
7. Now create a library containing the two functions. Call it lib\_math.a and place it in the same directory as your source code. Use the ar command. Google search to learn how to use this command.
8. Compile and link your program using this library instead of linking the object files directly.
9. Compile your program using the compiler option that generates assembly code (e.g., “-S” on most of your machines). View the assembly code and explain how it matches the source code.

Later in the semester we will replace all this with an integrated development environment that automates many of these details. The goal of this homework assignment is to give you some idea of how things work behind the scenes.

Submit a pdf document as your deliverable. Clearly show evidence you implemented the above correctly.