CS 4000

Homework # 1

due Monday Feb. 4th, 2019

(40 pts.)

1. (10 pts.) Implement a "hello-world" program using OpenMP. Your program should create as many threads as their are processors/cores on your current machine. From each thread that you create, your program should print:

   ```
   Hello from thread i.
   This is <Your Name>'s first parallel program
   There are currently n threads running
   ```

   Implement your program so that the text given above is printed in one block for each thread.

2. (10 pts.) Consider the following problem. Given an $n \times n$ matrix of numbers, an integer m, and a modulus q, find the largest product of m modulo q numbers in a row, either vertically, horizontally, or diagonally. Write a program that outputs the value of the largest product on a line by itself. For example, consider the following 5×5 matrix of values with the value $m = 4$ and $q = 1000000$:

   ```
   10  1  1  1  1
   1  10 11 12 13
   1  1  10 11 12
   1  1  1  10  1
   1  1  1   1 10
   ```

   Your program should produce the answer "17160" ($10 \times 11 \times 12 \times 13$). When $m = 5$, your program should answer "100000"

   Implement your program in C++ and provide adequate documentation. Test input/output examples will be provided to help you debug your code.

3. (20 pts.) Use OpenMP to implement a parallel version of the program that you implemented in problem #2. Implement your program using `#pragma omp parallel`.

   Compare your program's running time to your original program. Your program should be at least 75% efficient on a four core machine on put of a 1000 x 1000 array with $m = 500$.

   Implement your program in C++ and provide adequate documentation.