CSE 4502 (SWE) [Operating Systems Lab]
Lab # 10

Lab Tasks:

1. Write a multithreaded Pthreads program that outputs prime numbers. This program should work as follows: The user will run the program and will enter a number on the command line. The program will then create a separate thread that outputs all the prime numbers less than or equal to the number entered by the user.
2. Write a multithreaded program that generates the Fibonacci sequence using the Pthreads thread library. This program should work as follows: The user will enter on the command line the number of Fibonacci numbers that the program is to generate. The program will then create a separate thread that will generate the Fibonacci numbers, placing the sequence in data that can be shared by the threads (an array is probably the most convenient data structure). When the thread finishes execution, the parent thread will output the sequence generated by the child thread. Because the parent thread cannot begin outputting the Fibonacci sequence until the child thread finishes, this will require having the parent thread wait for the child thread to finish.
3. Given two matrices, A and B, where matrix A contains M rows and K columns and matrix B contains K rows and N columns, the matrix product of A and B is matrix C, where C contains M rows and N columns. The entry in matrix C for row i, column j ($C_{i,j}$) is the sum of the products of the elements for row i in matrix A and column j in matrix B. That is,

$$C_{i,j} = \sum_{n=1}^{k} A_{i,n} \times B_{n,j}$$

For example, if A is a 3-by-2 matrix and B is a 2 -by- 3 matrix, element $C_{3,1}$ is the sum of $A_{3,1} \times B_{1,1}$ and $A_{3,2} \times B_{2,1}$. For this task, calculate each element $C_{i,j}$ in a separate worker thread. This will involve creating M × N worker threads. The main or parent—thread will initialize the matrices A and B and allocate sufficient memory for matrix C, which will hold the product of matrices A and B. These matrices will be declared as global data so that each worker thread has access to A, B, and C.