1. Implement a revised version of Program 3.2: Trapezoidal rule of calculating the definite integral $\int_a^b f(x)dx$ such that the users can have their input, note that $f(x)$ is a function hardcoded in your program.

   INPUT: b – the upper bound of the interval;
   a – the lower bound of the interval;
   n – the number of subintervals (trapezoids).

   OUTPUT: The value of $\int_a^b f(x)dx$.

2. Use MPI_Reduce to rewrite the collective communication part of Problem 1.

3. Use MPI to implement the histogram program discussed in Chapter 2. Have process 0 read in the input data and distribute it among the processes. Also have process 0 printout the histogram. Note that the measurements are randomly generated based on *data_count, a,* and *b* input by the user.

   INPUT: *data_count* – the number of measurements;
   b – the upper bound of measurements;
   a – the lower bound of measurements;
   n – the number of bins.

   OUTPUT: The measurements;
   The range of each bin;
   The number of measurements in each bin.

Note: All programs have to be presented to the instructor on the class of due date.