Tutorial - 3

In this tutorial, you will test the *parallel for*, *reduction* directives that we learned in the class.

1. In trapezoidal rule each interval is approximated using a straight line, instead if it is approximated using a parabola the resulting integration formula is known as Simpson's rule and it can be expressed using the following equation:

$$I \approx \frac{h}{3}\left(f_0 + f_n + 4\left[\sum_{j=1,3,5,7,\ldots}^{n-1} f_j\right] + 2\left[\sum_{j=2,4,6,8,..}^{n-2} f_j\right]\right). \tag{1}$$

   Modify the numerical integration code that uses *parallel for* directive to evaluate the above integral. Use $n = 32, 128, 256$ and $p = 2$ and 4. Convince yourself that the error is much smaller with Simpson's rule than with the Trapezoidal rule.

2. Write an OpenMP parallel program that perfroms matrix addition and prints the resulting matrix. Use *parallel for* directive to accomplish this. Test your program with $p = 2, 4$ and 8.

3. Write a serial program and (try) an OpenMP parallel program (that can be executed with $p = 2, 4$) for finding the list of all prime numbers between 2 and n using the *sieve of Eratosthenes*. Consider n to be a large number to test your program. The algorithm is as follows:

   (a) Begin with a list of n natural numbers, $2, 3, 4, \ldots n$, that are not marked.

   (b) $k = 2$, the first unmarked number on the list.

   (c) Until $k^2 > n$, repeat the following:

      i. Mark all multiples of k between k^2 and n

      ii. Find the smallest number greater than k that is unmarked and set k to this new value.

   (d) The unmarked numbers are primes.

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16