Parallel Programming (COMP 403)

Sheet No.: 1

Title: Multi-threading using Pthreads

Q1:

Given two vectors $X = (x_1, x_2, \cdots, x_n)$ and $Y = (y_1, y_2, \cdots, y_n)$, both of size n. The vector-vector dot product is defined as follows:

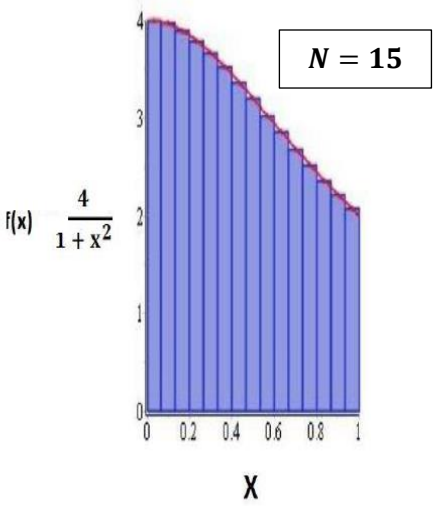
$$\boldsymbol{X \cdot Y = \sum_{i=1}^{n} x_i \cdot y_i}$$

a) Implement a sequential C++ program to perform the vector-vector dot product.
b) Try to speed up the program in (a) using C++ pthread multi-threading.

Q2:

In Mathematics, we have the following formula for Pi:

$$\int_0^1 \frac{4}{1+x^2}\, dx = \pi$$



Which can be approximated to the following summation:

$$\sum_{i=0}^{N} \frac{4}{1 + x_i^2}\, \Delta x \approx \pi$$

Where: the interval $[0, 1]$ is divided into N sub-intervals $[x_i, x_{i+1}]$

$x_0 = 0, x_N = 1, and\ x_i = x_{i-1} + \Delta x,$
where: $\Delta x = \frac{1}{N}$ (each sub-interval size).

increasing N gives a closer approximation of π

Write a Serial and Multi-threaded (*Using Pthread library*) C++ program to calculate an approximation (the closer the better) of π.