

MPI Exercise 1

An approximation to the value π can be obtained from the following expression

$$\frac{\pi}{4} = \int_0^1 \frac{dx}{1+x^2} \approx \frac{1}{N} \sum_{i=1}^N \frac{1}{1 + \left(\frac{i-\frac{1}{2}}{N}\right)^2},$$

where the answer becomes more accurate with increasing N . Iterations over i are independent so the calculation can be parallelised. For the following exercises you should set $N = 840$. This number is divisible by 2, 3, 4, 5, 6, 7 and 8 which is convenient when you parallelise the calculation on your laptop! Each process is responsible for a subset of the indices i .

Write two versions of a program that computes π using the above sum:

- a) Using point-to-point communications.
- b) Using collective communications.