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Distributed Lab
Solution Exercise 4

Q : 1 Calculating Pi using collective communication

UsedFormula : Bailey–Borwein–Plouffe formula

$$\pi = \sum_{i=0}^{\infty} [\frac{1}{16^i}(\frac{4}{8i+1} - \frac{2}{8i+4} - \frac{1}{8i+5} - \frac{1}{8i+6})]$$

By considering infinity equal n = 10^3 , 10^4 and 10^5

Methodology

- First set the precision of the decimal number upto 1001 , using the decimal function *getcontect ( ).prec = 1001*
- Divide N to number of process
- Each process takes the portion of N and calculate partial value of Pi independently using formula given formula
- in the end merge using comm.reduce(op=MPI.SUM)

	10^3	10^4	10^5
3 - process	1.2232279777	24.9142258167	**To much time**
4 - Process	1.00241589546	19.3190631866	
5 – process	0.888655185699	19.1090597542	

Q : 2 matrix multiplication using collective communication

Methodology Used :

- Get the matrix size from use , as of N, which makes N x N matrix with random numbers.
  - For the check purpose initialized all with 1, so resultant matrix is 4
- Now we have Matrix A , Matrix B
- For the convenient broadcast Matrix A and Matrix B to all all process.
- Now each process evaluate its row index from Matrix A & use these rows to multiple with Matrix B to get final matrix C rows
  - To evaluate row index of mat A , use Index and step size
  - such that stepSize = (Mat A .shape(0) / (workers – 1)
  - then Index = index + stepSize
- Now each process has process has resultant number of rows (Solution)
- Now use the **Result = gatherfunction (root = 0)** , to receive all rows in order.
- **Result** is the solution , but not in full matrix format, but one can change that using costly O(n^3) operation to get standardize matrix format (N x N)

	10^2	10^3	10^4
4	0.14323592186	0.788338899612	Too much time
5	0.0192210674286	0.799511909485	
8		0.990816831589	