

Homework 3

1. “printenv” is a UNIX command that prints out the environment. Run:
 - a. printenv
 - b. mpirun -n 1 printenv

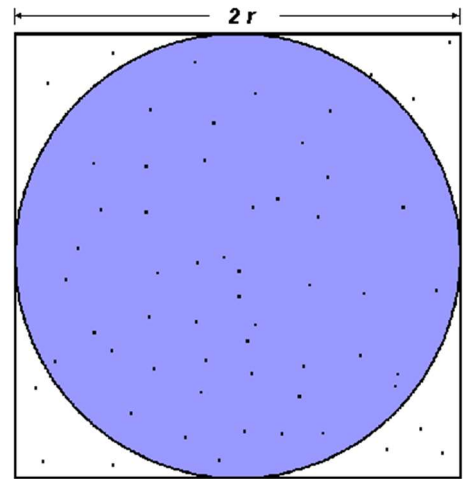
What is the difference in outputs? Do you see anything interesting?

2. Write an MPI program to time message transfers of various size messages (the time of sending a message from one processor to another and then receiving the same message back). Use MPI_Wtime to do the timing. From the data you get, figure out what the constants are for the formula $T_{\text{comm}} = t_{\text{startup}} + t_{\text{perdata}}L$, where L is the size of the message.

3. Write an MPI program to figure out π by the “dartboard method”.

A circular dartboard on a square background has a ration of the areas = $\pi r^2 / (2r)^2 = \pi/4$.

If we throw darts randomly at the dartboard, and examine whether they fall in the circle or not, we can figure out this ratio and therefore estimate π .



$$\begin{aligned} A_S &= (2r)^2 = 4r^2 \\ A_C &= \pi r^2 \\ \pi &= 4 \times \frac{A_C}{A_S} \end{aligned}$$