CZ4102 High Performance Computing

Tutorial 4

To be discussed on 10 Nov 2005.

Please solve the tutorial questions in advance.

- 1. Describe a parallel formulation of matrix-vector multiplication in which the matrix is 1-D block-partitioned along the columns and the vector is equally partitioned among all the processes. Show that the parallel run time is the same as in case of rowwise 1-D block partitioning.
- 2. <u>Figure 8.7</u> of textbook shows that the pipelined version of Gaussian elimination requires 16 steps for a 5 x 5 matrix partitioned rowwise on five processes. Show that, in general, the algorithm illustrated in this figure completes in 4(n 1) steps for an $n \ge n$ matrix partitioned rowwise with one row assigned to each process.



- 3. Let f' denote the fraction of total execution time on the serial portion of a parallel algorithm using p processors. Show that the speedup of the parallel algorithm is not more than p (p-1)f'. Explain the different purposes of this speedup formulation with the speedup formulated by Amdahl's Law.
- 4. The claim that "<u>using 1 processor in computation is *p* times slower than using *p* processors if communication overhead can be ignored" is too optimistic. Do you agree? Justify.</u>
- 5. What type of problem is not suitable for High Performance Computing?
- 6. Give a checklist used to increase the chance of achieving a promising speedup in High Performance Computing.
- 7. Besides achieving a speedup, what is the other purpose of doing High Performance Computing?
- 8. Is it worthwhile to do High Performance Computing?

Question 4, 5, 6, 7 and 8 are for you to show me that you have learnt something from this course.

Please solve the tutorial questions in advance to gain the maximum benefit from our tutorial session.