

Name: _____

Directions: **Work only on this sheet** (on both sides, if needed); do not turn in any supplementary sheets of paper. There is actually plenty of room for your answers, as long as you organize yourself BEFORE starting writing.

1. (25) Name the OpenMP functions analogous to `MPI_Comm_size()` and `MPI_Comm_rank()`.
2. (25) Suppose OpenMP did not include the `single` pragma. Rewrite lines 91-92, p.51, without using that pragma. Keep it short! It just has to work, not necessarily be optimal.
3. (25) (Canceled.)
4. (25) Suppose we have the system on p.23, with low-order interleaving, and we have a long array `x`. Say it takes one clock cycle to move a message one hop in the network, e.g. from one diamond to the one above it, and messages to access `x[i]` and `x[j]` leave P2 and P1 at times 0 and 1, respectively. Then give a mathematical necessary and sufficient condition for there to be a “collision” between the two messages, i.e. one will delay the other at some diamond. Express your answer in math, not English. Any math symbol can be used, including ones made from letters such as `cos`.

Solutions:

1.

```
omp_get_num_threads()
omp_get_thread_num()
```

2.

```
if (me == 0) { md = largeint; mv = 0; }
#pragma omp barrier
```

4. $(i \bmod 8) \leq (j \bmod 8)$