

# COMP 322: Fundamentals of Parallel Programming (Spring 2015)

Instructor: Vivek Sarkar

Worksheet 1: due at end of class today

Name: \_\_\_\_\_

Netid: \_\_\_\_\_

*Honor Code Policy for Worksheets: You are free to discuss all aspects of in-class worksheets with your other classmates, the teaching assistants and the professor during the class. You can work in a group and write down the solution that you obtained as a group. If you work on the worksheet outside of class (e.g., due to an absence), then it must be entirely your individual effort, without discussion with any other students. If you use any material from external sources, you must provide proper attribution.*

## Parallelizing Matrix Multiply

Consider the sequential version of a matrix-multiply algorithm shown below that computes the product of two  $N \times N$  matrices A and B into an  $N \times N$  matrix C, assuming that all entries in C were initialized to zeros. (Matrices are represented as 2D arrays in Java.)

Indicate in the space provided where you can insert async and finish pseudocode annotations to ensure that the parallel version always computes the same result as the sequential version, while maximizing the available parallelism.

### Sequential version:

```
for (int i = 0 ; i < N ; i++)
  for (int j = 0 ; j < N ; j++)
    for (int k = 0 ; k < N ; k++)
      C[i][j] = C[i][j] + A[i][k] * B[k][j];

System.out.println(C[0][0]);
```

### Parallel version with async & finish annotations inserted (to be completed):