CS 5740	**Parallel and Distributed Computing**	Test 2
Name:	Spring 2008	Max Pts: 50

Important: This is an open book test. You can use any books, notes, or paper, but not exchange anything with other students. You are not allowed to use any electronic/communication devices, including a calculator. *Do not log into the computer during the test. Switch off your cell phones.* Any calculations and rough work can be done on the back side of the test pages. You will lose five points for not writing your name.

1. [10 pt] Consider a simple block allocation of n data items to p processes in which the first $p-1$ processes get $\lceil n/p \rceil$ items each and the last process gets what is left over.

   (a) Find values for n and p where the last process does not get any elements.

   (b) Find values for n and p where $\lfloor p/2 \rfloor$ processes do not get any values. Assume $p > 1$.

2. [10 pt] Benchmarking of a sequential program reveals that 95% of the execution time is spent inside functions that are amenable to parallelization. What is the maximum speedup we could expect from executing a parallel version of this program on 10 processors?

3. [10 pt] In matrix vector multiplication, we replicated the entire vector across all the processors whereas we distributed the matrix as row-striped or column-striped. Why not replicate the matrix across the processors as well?

4. [10 pt] Suppose we have chosen a block agglomeration of n elements (labeled $0, 1, \ldots, n-1$) to p processes (labeled $0, 1, \ldots, n-1$) in which process i is responsible for elements $\lfloor in/p \rfloor$ through $\lfloor (i+1)n/p \rfloor - 1$. Prove that the last process is responsible for $\lceil n/p \rceil$ elements.

5. [10 pt] Give two reasons why the use of nonblocking sends and receives can reduce the execution time of a parallel program.