CS 5740 Parallel and Distributed Computing
Name: Spring 2010

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.

Test 1

Max Pts: 40

1. [10 pt] Suppose you own a hole punch capable of putting a hole in an arbityrarily thick stack of paper. If you insert the paper into the hole punch and activate it, you will have a piece of paper with one hole in it. If you fold the paper in half before inserting it into the hole punch, you will have a piece of paper with two holes in it. If you can only use the hole punch once, how many time must you fold a piece of paper in order to put n holes in it? Prove that your answer is correct and optimal.

2. [10 pt] Name two advantages commodity clusters have over commercial parallel computers. Name one advantage a commercial parallel computer has over a commodity cluster.

3.	[10 pt] Given a processor array containing eight processing elements, each capable of performing 10 million integer operations per second, determine the performance in millions of operations per second of this processor array adding two integer vectors, for vectors of size 1, 8, and 50.
4.	$[10~\mathrm{pt}]$ A directory-based protocol is a popular way to implement cache coherence on a distributed multiprocessor.
	(a) Why should the directory be distributed among the multiprocessor's local memories?
	(b) Why are the contents of directory not replicated?