CS 5130	**Advanced Data Structures and Algorithms**	Test 2
Name:	Fall 2006	Max Pts: 65

Important: This is an open book test. You can use any books, notes, or paper. *Do not log into the computer during the test*. Switch off any communications devices, including 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] A friend of mine suggested to me that the number for solutions for any n-queen problem ($n \geq 4$) is always even. He said that for 4-queen problem, there are two solutions, for 5-queen problem, there are ten solutions, and so on. Do you think he is right? Explain your answer.

2. [10 pt] Given a sequence of n numbers, the distinct elements problem is to check if there are equal numbers. Give an $O(1)$ time nondeterministic algorithm for this problem.

3. [10 pt] Give an algorithm to count the number of leaf nodes in a binary tree. What is its computational complexity?

4. [15 pt] Draw the branch and bound tree to solve the traveling salesperson problem for the following data set of five cities:

	A	B	C	D	E
A	-	22	9	15	27
B	9	-	30	8	6
C	24	14	-	21	16
D	16	5	7	-	20
E	8	9	5	21	-

Use greedy algorithm to get the first bound.

5. [10 pt] Consider the following instance of knapsack problem: $n = 4$, $m = 119$, $P = \{95, 25, 41, 21\}$, $W = \{63, 29, 9, 26\}$. What is the value of $\rho(n)$ for the greedy algorithm for this instance?

6. [10 pt] Draw the following undirected graph and find its vertex cover:

	A	B	C	D	E	F
A	-	0	1	0	1	1
B		-	1	1	0	0
C			-	1	1	0
D				-	0	0
E					-	1
F						-