Name_____

CSE 370 – Introduction to Digital Logic Design
Spring 2010
Quiz #2

For maximum credit, show all your work. Please raise your hand if you have a question.

Design a circuit that determines the number of leading 0's in a 3-bit number. Since the output value can be 0 – 3, the output is a 2-bit number. For example, if the input is 001, the output is 10 (2) and if the input is 101, the output is 00 (0). Thus you need to design two functions of three inputs, one for each output bit. Draw a circuit implementation of these functions using only NAND gates and inverters.

Hint: Truth table → Boolean equation → AND/OR circuit → NAND only circuit

[Extra credit: Find a cheap circuit. We measure the cost of the circuit by counting all the inputs of all the gates. Inverters are free.]

A	B	C	F1	F0
0	0	0	1	1
0	0	1	1	0
0	1	0	0	1
0	1	1	0	1
1	0	0	0	0
1	0	1	0	0
1	1	0	0	0
1	1	1	0	0

F1 = A'B'C' + A'B'C = A'B'
F2 = A'B'C' + A'BC' + A'BC = A'B + A'C' = A'(B + C')

Extra credit:
+1 for ≤ 10 literals
+2 for ≤ 8 literals
+3 for ≤ 6 literals