All the normal rules apply: *Due next class, work on separate paper, start early, show your work, label everything, specify units, circle answers.*

Remember there are three standard ways to express A=0. In Boolean form they are A' = !A = Â. Read the notation carefully!

A "simple logic diagram" uses basic logic symbols.
A "fully labeled circuit schematic" shows the logic symbols, device part numbers, and pin numbers.

A Quad 2-input AND gate is a 74HC08 which has four 2-input AND gates on one chip. A Quad 2-input OR gate is a 74HC32 which has four 2-input OR gates on one chip. A Hex Inverter, with 6 NOT gates on one chip, is a 74HC04. Refer to your notes for pin assignments or use the internet to look up a spec sheet. Read the diagrams carefully!

1. From the given truth table below:
    a. Write a Boolean equation in canonical form for the output F in terms of the inputs A, B, C.
    b. Draw a simple logic diagram (no need for device or pin numbers) for your equation from part a using 2-input AND and OR gates, and Inverters.
    c. Reduce the original equation using Boolean algebra (as a sum of products you should end up with no more than 3 terms).
    d. Draw a new simple logic diagram for your reduced equation from part c using Quad 2-input AND and OR gates, and NOT gates.

A	B	C	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

2. Construct a truth table for each of the following Boolean expressions (you may have to use some Boolean algebra, or try making a truth table column for each grouping, then a master F column).
    a. F = A' + ABC
    b. F = !ABC + ABC + AB!C
    c. F = (A + B' + C)(A + C')(B + C') (Hint: make a column for each parenthetical phrase, then AND the three columns into a final F column)
    d. F = AB!C!D + ABC!D + !AD + AD

3. Using the functions from parts **a** through **c** in problem 2 above, draw simple logic diagrams to represent the boolean equations in their unreduced form.

4. For the logic function in problem **2d** above: F = AB!C!D + ABC!D + !AD + AD

    a. Draw and fully label a circuit schematic to realize the logic function (do not reduce). Use Quad 2-input AND and OR gates, and Hex Inverters, label all circuit components and pins.

    b. Reduce the original equation using Boolean algebra – you should be able to get it down to 2 terms in "sum of products" form.

    c. Draw and fully label a new circuit schematic for your reduced equation from part 5b using Quad 2-input AND and OR gates, and Hex Inverters, label all circuit components and pins.

    d. Given the choice, which circuit would you build - the original from part a or the reduced version from part c? Give at least two measurable reasons why, and quantify the difference.