CSCI 210 Assn. 4: Logic circuits

This assignment, worth 15 points, is due at the beginning of class on Friday, March 26. Note that Exam 2 is also that day, so you will probably want to do it well ahead of that to give you time to study.

The assignment covers material from Chapter 11 of the textbook, which duplicates what you studied in CSCI 150, and which we will not review in CSCI 210. You are responsible for all the material in those sections, for Exam 2 and succeeding tests.

Submit your solutions on paper, handwritten or typed. Be neat: Particularly, don't submit a sheet torn from a spiral notebook.

A4–1. Draw a logic circuit with no more than ten AND, OR, and NOT gates computing the following truth table.

x	y	z	output
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

A4–2. Using the identities in Figure 11.2 (page 143), convert $\overline{x + \bar{x}\bar{y}yz}$ into a sum-of-products expression. That is, any NOTs occurring in your expression should be the NOT of one variable only, and if your expression contains both ANDs and ORs, the expression should be the OR of several ANDs, with no parentheses required to express the proper order of operations. No term (i.e., group of items ANDed together) should have the same variable multiple times.

Show each step of your simplification, and give the name of the identity used for that step. (You do not need to include steps involving the commutative or distributive laws.) For example, if you were to convert $x\overline{xy}$, your answer could read as follows.

$x\overline{xy}$	original expression
$x(\bar{x} + \bar{y})$	DeMorgan's law
$x\bar{x} + x\bar{y}$	distributive law
$0 + x\bar{y}$	inverse law
$x\bar{y}$	identity law

I recommend that you verify that the original and final expressions have the same value by confirming that their truth tables match. (You might use Logisim to accomplish this.)