CPSC 31 Intro to Computer Systems

Assignment #1

Due at the beginning of class, Thursday February 16

The basic gates AND, OR, and NOT are a *universal gate set*, meaning that we can construct any combinational circuit using only these gates. By solving problems 13, you will demonstrate that NAND constitutes a universal gate set by itself.

1. Construct a NOT gate using only NAND gate(s)

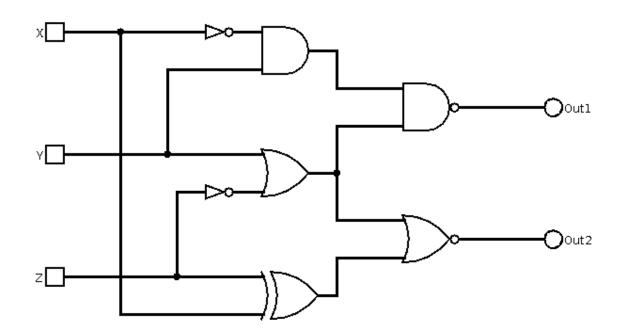
2. Construct an AND gate using only NAND gate(s).

3. Construct an OR gate using only NAND gate(s). Hint: by De Morgans law, $X \mid Y \equiv \ \sim (\sim X \ \& \sim Y)$.

4. Construct an XOR gate using only NAND gates.

5. Fill in the truth table for the following circuit.

Х	Y	Z	out_1	out_2
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		



6. Construct a circuit that implements the following truth table. You may use any of the following one- or two-input gates: NOT, AND, OR, XOR, NAND, NOR, XNOR.

X	Y	Z	out_1	out_2
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	0
1	0	0	0	1
1	0	1	0	1
1	1	0	1	1
1	1	1	0	0