Recitation 4

Date: Feb 24, 2013

For practice using Logism, try building circuits for the following truth tables in Logism!

p	q	f(p, q)
T	T	F
T	F	F
F	T	F
F	F	T

p	q	r	f(p, q, r)
T	T	T	F
T	F	T	F
F	T	T	F
F	F	T	T
T	T	F	F
T	F	F	T
F	T	F	F
F	F	F	T

Problem 4.1

You may recall learning that the *AND*, *OR*, and *NOT* gates are, together, capable of expressing all of logic. Put another way, if you can build each of the truth tables for *AND*, *OR*, and *NOT* using some combination of expressions, then you can build any truth table using that combination.

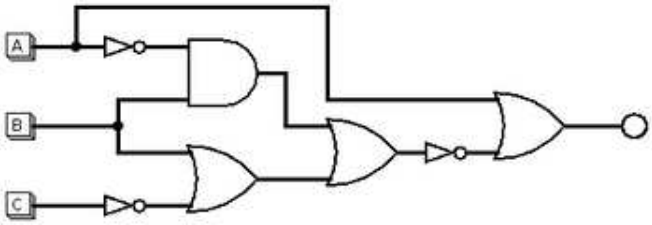
(a) Prove that we **cannot** express all logic gates using only the *XOR* gate.

(b) Prove that we **cannot** express all of logic using only the $\rightarrow$ expression.

(c) Prove that we **can** express all of logic using only the $\rightarrow$ expression and *NOT* gates.

Note: To represent a particular logic gate, you may only use the inputs specified for that gate.

Problem 4.2



This circuit looks a little overcomplicated.

a. Write out the expression for the circuit

b. Simplify the expression

c. Verify that the expressions are equivalent using truth tables

d. Draw the circuit for the simplified expression