MAT 115: Finite Math for Computer Science
Problem Set 1

Due: 09/21/2015

Problem 1 Truth Table

Make a truth table for $(p \vee (\sim p \vee q)) \wedge \sim (q \wedge \sim r)$

Problem 2 Proof: Algebraic Rules for Boolean Functions

Show that $p \vee (p \wedge q) = p$ follows from the idempotent rule, distributive rule and the absorption rule $p \wedge (p \vee q) = p$

Problem 3 Proof: Algebraic Rules for Boolean Functions

Is the function $(p \wedge (\sim (\sim p \vee q))) \vee (p \wedge q)$ equal to the function $p \vee q$. If yes, please show it. If not, please disprove it and show the counter example.

Problem 4 Boolean Functions

Given a function $f : \{0, 1\}^3 \to \{0, 1\}$, please answer the following :
(a) Please show all the elements in the domain.
(b) How many elements are there in the codomain?
(c) What is the number of possible boolean functions f?

Problem 5   More than Boolean Functions

Given a function $f : \{0, 1, 2\}^t \to \{0, 1, 2, 3\}$, please answer the following :
(a) What is the length of an input? Give an example of an input.
(b) How many possible inputs are there in the domain?
(c) How many elements are there in the codomain?
(d) What is the number of possible mapping functions f that satisfies this definition?

Problem 6   Base Change

Convert the following numbers
(a) EE0A (hex number into decimal form)
(b) 1001011 ((binary number into decimal form)
(c) 345 (decimal number into binary form)
(d) 345 (decimal number into ternary form)

Problem 7   Representing Function

Given $f : \{0, 1\}^2 \to \{0, 1\}$, we can easily interpret it as $f(p, q) = r$ where $p, q \in \{0, 1\}$ and $r \in \{0, 1\}$. If we have $f(0, 0) = 1, f(0, 1) = 1, f(1, 0) = 0$ and $f(1, 1) = 1$. Please derive the boolean function f in terms of p and q.

Problem 8   Practice Problems

For practice only. You do not have to turn in the solution.
Unit BF: 1.11, 1.12, 1.13