Math 220 Homework 3

Due on September 24, 2021 Name______________________________________

William Friend

1. For the following construct a Boolean function equal to the function S defined by the given truth table. Make your function as simple as you can.

P	Q	R	S = f(P, Q, R)
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	F
F	T	T	F
F	T	F	T
F	F	T	F
F	F	F	F

$(p \wedge q \wedge r) \vee (p \wedge q \wedge \neg r) \vee (p \wedge \neg q \wedge r) \vee (\neg p \wedge q \wedge \neg r)$

redundancy law:

$(p \wedge q) \vee (p \wedge \neg q \wedge r) \vee (\neg p \wedge q \wedge \neg r)$

2. Create the truth table for the following statement: $\neg[(\neg p) \wedge q] \rightarrow r$

p	q	r	$\neg p$	$\neg p \wedge q$	$\neg(\neg p \wedge q)$	$\neg(\neg p \wedge q) \rightarrow r$
T	T	T	F	F	T	T
T	T	F	F	F	T	F
T	F	T	F	F	T	T

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T	F	F	F	F	T	F
F	T	T	T	T	F	T
F	T	F	T	T	F	T
F	F	T	T	F	T	T
F	F	F	T	F	T	F

3. Prove (or disprove) the following:

$\neg(x \rightarrow (\neg y))$ is logically equivalent to $x \wedge y$

x	y	x∧y
T	T	T
T	F	F
F	T	F
F	F	F

x	y	not y	x→(¬y)	¬(x→(¬y))
T	T	F	F	T
T	F	T	T	F
F	T	F	T	F
F	F	T	T	F

Both truth tables for ¬(x→(¬y)), and x∧y result in the sequence T, F, F, and F. Therefore ¬(x→(¬y)), and x∧y are logically equivalent.

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