Homework 6

Anthony Jones

1. a) $T \wedge T \equiv T$ (Sorry for letters)

$T \wedge F \equiv F$

$T \wedge T \wedge T \wedge T \wedge F \equiv$ (F)

b) $(\neg TRUE) \equiv FALSE$

$FALSE \vee TRUE \equiv$ (TRUE)

c) $(TRUE \vee TRUE) \equiv TRUE$

$\neg TRUE \equiv FALSE$

(FALSE)

d) (From c) $TRUE \vee TRUE \equiv TRUE$

$TRUE \wedge FALSE \equiv$ (FALSE)

e) (TRUE)

(a) does not matter because the and operator will always ripple false for the expression

$\rightarrow$ $TRUE \wedge \underline{TRUE \wedge FALSE}$

$\equiv TRUE \wedge (TRUE \wedge FALSE)$

$\equiv \underline{TRUE \wedge FALSE}$

Homework 5

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2. Prove $(x \wedge y) \vee (x \wedge \neg y) \equiv x$

x	y	¬y	x∧y	x∧¬y	(x∧y)∨(x∧¬y)
T	T	F	T	F	T
T	F	T	F	T	T
F	T	F	F	F	F
F	F	T	F	F	F

The columns for $(x \wedge y) \vee (x \wedge \neg y)$ and X are the same, and therefore they are logically equivalent.

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3. Prove $(x \vee y) \rightarrow z \equiv (x \rightarrow z) \wedge (y \rightarrow z)$

x	y	z	x∨y	(x∨y)→z	x→z	y→z	...
T	T	T	T	T	T	T	T
T	T	F	T	F	F	F	F
T	F	T	T	T	T	T	T
T	F	F	T	F	F	T	F
F	T	T	T	T	T	T	T
F	T	F	T	F	T	F	F
F	F	T	F	T	T	T	T
F	F	F	F	T	T	T	T

The columns for $(x \vee y) \rightarrow z$ and $(x \rightarrow z) \wedge (y \rightarrow z)$ are the same, and therefore they are logically equivalent.

Homework 5

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4. a) $(x \vee y) \wedge (x \vee \neg y) \wedge \neg x \equiv F$?

x	y	¬x	¬y	a: x∨y	b: x∨¬y	a∧b∧¬x
T	T	F	F	T	T	F
T	F	F	T	T	T	F
F	T	T	F	T	F	F
F	F	T	T	F	T	F

The statement is a contradiction because its column is all FALSE.

b) $x \wedge (x \rightarrow y) \wedge (\neg y)$

x	y	¬y	x→y	x∧(x→y)∧(¬y)
T	T	F	T	F
T	F	T	F	F
F	T	F	T	F
F	F	T	T	F

The statement is a contradiction because its column is all FALSE.

c) $(x \rightarrow y) \wedge ((\neg x) \rightarrow y) \wedge \neg y$

x	y	¬x	¬y	a: x→y	b: ¬x→y	a∧b∧¬y
T	T	F	F	T	T	F
T	F	F	T	F	T	F
F	T	T	F	T	T	F
F	F	T	T	T	F	F

→ contradiction.