CS225 Assignment 1.2 Jason Dorweiler

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6:57 PM

Section 1.3: 8, 14, 16, 20, 32

8. Use De Morgan's laws to find the negation of each of the following statements.

a) Kwame will take a job in industry or go to graduate school.

p: Kwame will take a job in industry; q: go to graduate school.

$(p \vee q)$, $\neg(p \vee q) \equiv \neg p \wedge \neg q$

Kwame will not take a job in industro nor go to graduate school

b) Yoshiko knows Java and calculus.

p: Yoshiko knows Java; q: calculus.

$(p \wedge q)$, $\neg(p \wedge q) \equiv \neg p \vee \neg q$

Yoshiko does not know Java or calculus

c) James is young and strong.

p: James is young; q: strong.

$(p \wedge q)$, $\neg(p \wedge q) \equiv \neg p \vee \neg q$

James is not young or strong

d) Rita will move to Oregon orWashington.

p: Rita will move to Oregon; q: Washington.

$(p \vee q)$, $\neg(p \vee q) \equiv \neg p \wedge \neg q$

Rita will not move to Oregon nor Wasington

14.

$(\neg p \wedge (p \rightarrow q)) \rightarrow \neg q$

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

$p \rightarrow \neg q \equiv \neg p \vee \neg q$

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

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

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

Tbl. 6 pg. 27 (absorption)

$p \vee \neg q \rightarrow \neg q$

p	q	$\neg q$	$p \vee \neg q$	
T	T	F	T	F

← False so not tautology

p	q	¬q	p ∨ ¬q	↓
T	T	F	T	F
T	F	T	T	T
F	T	F	F	T
F	F	T	T	T

← False so not tautology

16. $p \leftrightarrow q \equiv (p \wedge q) \vee (\neg p \wedge \neg q)$

p	q	¬p	¬q	(p ∧ q)	(¬p ∧ ¬q)	↓	p ↔ q
T	T	F	F	T	F	T	T
T	F	F	T	F	F	F	F
F	T	T	F	F	F	F	F
F	F	T	T	F	T	T	T

They are equivalent

20 $\neg(p \oplus q) \equiv p \leftrightarrow q$

p	q	(p ⊕ q)	¬(p ⊕ q)	p ↔ q
T	T	F	T	T
T	F	T	F	F
F	T	T	F	F
F	F	F	T	T

equivalent

32 $(p \wedge q) \rightarrow r$ not L.E. $(p \rightarrow r) \wedge (q \rightarrow r)$

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

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

A B

¬p	¬q	r	A	B
F	F	T	F	F
F	F	F	F	F
F	T	T	T	F
F	T	F	T	F

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

not equivalent