

HW 1.3 (8, 14, 16, 20, 32)
OR 1.2

DOB NAVARRO

4/5/15

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

p = TAKE A JOB

q = GO TO GRAD SCHOOL

$$p \vee q \equiv \neg p \wedge \neg q \quad \text{NEGATION}$$

\hookrightarrow KWAME WILL NOT TAKE JOB AND WILL NOT GO TO GRAD SCHOOL

b) Yoshiko knows Java and Calculus.

p = KNOWS JAVA ... q = KNOWS CALCULUS

$$p \wedge q \equiv \neg(p \wedge q) \quad \text{NEGATION}$$

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

YOSHIKO DOESN'T KNOW JAVA OR DOESN'T KNOW CALCULUS.

c) James is young and strong

p = IS YOUNG q = IS STRONG

$$p \wedge q \equiv \neg(p \wedge q) \quad \text{NEGATION}$$

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

JAMES IS NOT YOUNG OR IS NOT STRONG.

d) Rita will move to Oregon or Washington

p : MOVE TO OREGON

q MOVE TO WASHINGTON

$$p \vee q \equiv \neg(p \vee q) \quad \text{NEGATION}$$

$$\neg p \wedge \neg q$$

RITEA WILL NOT MOVE TO OREGON AND SHE WILL NOT MOVE TO WASHINGTON.

14) $(\neg p \wedge (p \rightarrow q)) \rightarrow \neg q$ TAUTOLOGY?

| p | q | $\neg p$ | $\neg q$ | $p \rightarrow q$ | $\neg p \wedge (p \rightarrow q)$ | $(\neg p \wedge (p \rightarrow q)) \rightarrow \neg q$ |
|---|---|----------|----------|-------------------|-----------------------------------|--|
| T | T | F | F | T | F | T |
| T | F | F | T | F | F | T |
| F | T | T | F | T | T | F |
| F | F | T | T | T | T | T |

← NOT A TAUTOLOGY

16) $p \leftrightarrow q$ AND $(p \wedge q) \vee (\neg p \wedge \neg q)$ EQUIV?

$p \leftrightarrow q$

| p | q | $p \rightarrow q$ | $q \rightarrow p$ | $p \leftrightarrow q$ |
|---|---|-------------------|-------------------|-----------------------|
| T | T | T | T | T |
| T | F | F | T | F |
| F | T | T | F | F |
| F | F | T | T | T |

| p | q | $\neg p$ | $\neg q$ | $p \wedge q$ | $\neg p \wedge \neg q$ | $(p \wedge q) \vee (\neg p \wedge \neg q)$ |
|---|---|----------|----------|--------------|------------------------|--|
| T | T | F | F | T | F | T |
| T | F | F | T | F | F | F |
| F | T | T | F | F | F | F |
| F | F | T | T | F | T | T |

EQUIVALENT

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

| p | q | $p \oplus q$ | $\neg(p \oplus q)$ |
|---|---|--------------|--------------------|
| T | T | F | T |
| T | F | T | F |
| F | T | T | F |
| F | F | F | T |

SEE PROBLEM 16 FOR $p \leftrightarrow q$ TRUTH TABLE

$\neg(p \oplus q)$ AND $p \leftrightarrow q$ ARE EQUIVALENT

92)

$(p \wedge q) \rightarrow r$ AND $(p \rightarrow r) \wedge (q \rightarrow r)$ EQUIVALENT?

$$p \wedge q \rightarrow r \equiv \neg(p \wedge q) \vee r \quad \text{TABLE 7}$$

$$\equiv (\neg p \vee \neg q) \vee r \quad \text{DE MORGANS}$$

$$(p \rightarrow r) \wedge (q \rightarrow r) \equiv (p \vee q) \rightarrow r \quad \text{TABLE 7}$$

$$\equiv \neg(p \vee q) \vee r \quad \text{TABLE 7}$$

$$\equiv (\neg p \wedge \neg q) \vee r \quad \text{DE MORGANS}$$

AFTER SIMPLIFYING IT'S CLEAR THAT THESE ARE NOT EQUIVALENT DUE TO $(\neg p \vee \neg q)$ AND $(\neg p \wedge \neg q)$.