No.

Date

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Answear for question 1.

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

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

$= p \vee \neg q \vee r$

$q \to (p \vee r) = \neg q \vee (p \vee r) = p \vee \neg q \vee r$

$\therefore$ logically equal

Answear for question 2.

p	q	r	$\neg p$	$\neg p \wedge q$	$p \oplus q$	$p \oplus q \to r$	$(\neg p \wedge q) \vee (p \oplus q \to r)$	$r \to p$
T	T	T	F	F	F	F	F	T
T	T	F	F	F	F	T	T	F
T	F	T	F	F	T	T	T	T
T	F	F	F	F	T	F	F	F
F	T	T	T	T	T	T	T	F
F	T	F	T	T	T	F	T	T
F	F	F	T	F	F	T	T	T
F	F	T	T	F	F	F	F	T

a

Q3: Contingent

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Q4

$P(x)$ = "x likes sweetcorn" $Q(x)$ = "x likes peas"

$M(x)$ = "x likes chips" the domain of x is the group of friends

(a) $\forall x (P(x) \to Q(x))$ (b) $\neg \forall x (Q(x) \to M(x))$

(c) $\neg \forall x (M(x) \land P(x)) \equiv \exists x (\neg M(x) \lor \neg P(x))$

Q5: according to (b), $\neg \forall x (Q(x) \to M(x))$

$\neg (Q(c) \to M(c))$ Universal Instantiation

$\neg M(c) \land Q(c)$

$\exists x (\neg M(x) \land Q(x))$

which is contradictory to $\exists x (M(x) \land \neg Q(x))$ $\therefore$ impossible

Q6: $\forall x (P(x) \to Q(x))$ c is in the domain

$P(c) \to Q(c)$

$\neg \forall x (Q(x) \to M(x))$

$\neg (Q(c) \to M(c))$

$Q(c) \land \neg M(c)$

$Q(c)$

$P(c)$

$\neg M(c)$

$\neg M(c) \lor \neg P(c)$

$\therefore \exists x (\neg M(x) \lor \neg P(x))$