Student Information

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Answer 1

a)

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

b)

$(p \to ((q \vee \neg p) \to r)$	$\equiv$	$\neg p \vee ((q \vee \neg p) \to r$	Table 7 Line 1
	$\equiv$	$\neg p \vee (\neg(q \vee \neg p) \vee r)$	Table 7 Line 1
	$\equiv$	$\neg p \vee ((\neg q \wedge \neg\neg p) \vee r)$	Table 6 De Morgan's Law
	$\equiv$	$\neg p \vee ((\neg q \wedge p) \vee r)$	Table 6 Double Negation Law
	$\equiv$	$\neg p \vee ((\neg q \vee r) \wedge (p \vee r))$	Table 6 Distributive Law
	$\equiv$	$(\neg p \vee (\neg q \vee r)) \wedge (\neg p \vee (p \vee r))$	Table 6 Distributive Law
	$\equiv$	$(\neg p \vee (\neg q \vee r)) \wedge ((\neg p \vee p) \vee (\neg p \vee r))$	Table 6 Distributive Law
	$\equiv$	$(\neg p \vee (\neg q \vee r)) \wedge (T \vee (\neg p \vee r))$	Table 6 Negation Law
	$\equiv$	$(\neg p \vee (\neg q \vee r)) \wedge T$	Table 6 Domination Law
	$\equiv$	$\neg p \vee (\neg q \vee r)$	Table 6 Identity Law
	$\equiv$	$(\neg p \vee \neg q) \vee r$	Table 6 Associative Law
	$\equiv$	$\neg(\neg p \vee \neg q) \to r$	Table 7 Line 3
	$\equiv$	$(\neg\neg p \wedge \neg\neg q) \to r$	Table 6 De Morgan Law
	$\equiv$	$(p \wedge q) \to r$	Table 6 Double Negation Law

c)

1-) F
2-) F
3-) F
4-) T
5-) T

Answer 2

a) $\exists x(P(Can, x) \land T(x, L))$

b) $\forall x(T(x, S) \rightarrow \exists y(P(y, x) \land N(y, Turkish)))$

c) $\forall x(T(x, S) \rightarrow \exists y(R(x, y) \land T(y, S) \land \forall z((R(x, z) \land T(z, S)) \rightarrow (z = y)))$

d) $\forall x(\exists y(N(y, English) \land P(y, x)) \rightarrow \neg W(M, x)))$

e) $\exists x \exists y((x \neq y) \land N(x, Turkish) \land N(y, Turkish) \land P(x, G) \land P(y, G) \land$
$\forall z((P(z, G) \land N(z, Turkish)) \rightarrow ((z = y) \lor (z = y))))$

f) $\exists x \exists y \exists z(T(x, y) \land T(x, z) \land (y \neq z))$

Answer 3

1. $p \rightarrow q$	*premise*
2. $(r \land s) \rightarrow p$	*premise*
3. $r \land \neg p$	*premise*
4. $\neg q$	$\land e, 3$
5. r	$\land e, 3$
6. s	*assumed*
7. $r \land s$	$\land i, 5, 6$
8. p	$\rightarrow e, 2, 7$
9. q	$\rightarrow e, 1, 8$
10. $\bot$	$\neg e, 4, 9$
11. $\neg s$	$\neg i, 6 - 10$

Answer 4

Premise 1 - $\exists x(P(x) \to S(x))$
Premise 2 - $\forall x P(x)$
Claim - $\exists x S(x)$

1. $\exists x(P(x) \to S(x))$	*premise*
2. $\forall x P(x)$	*premise*
3. $P(a) \to S(a)$	*assumed*
4. $P(a)$	$\forall e, 2$
5. $S(a)$	$\to e, 3, 4$
6. $\exists x S(x)$	$\exists i, 5$
7. $\exists x S(x)$	$\exists e, 1, 3-6$