Student Information

Full Name : Ayşegül Erdem
ID: 2633196

Answer 1

a)

It is not a tautology, and not a contradiction

p	q	¬p	¬ q	p∨ q	p ∧ (p∨q)	p∧ (p∨ q) ∧ ¬q	¬p ∧ q	(¬p∧ q)∨ (p ∧ (p∨ q) ∧ ¬ q)
T	T	F	F	T	T	F	F	F
T	F	F	T	T	T	T	F	T
F	T	T	F	T	F	F	T	T
F	F	T	T	F	F	F	F	F

b)

1. p ∨(¬ (¬ q) ∨ (p ∧ r)) — Table 7 1st Law
2. p ∨ (q ∨ (p ∧ r)) — Table 6 Double Negation Law
3. (p ∨ q) ∨ (p ∧ r) — Table 6 Associative Laws 1st
4. (q ∨ p) ∨ (p∧ r) — Table 6 Commutative Laws 1st
5. q ∨ (p ∨ (p∧ r)) — Table 6 Associative Laws 1st
6. q ∨ p — Table 6 Absorption Laws 1st
7. p ∨ q — Table 6 Commutative Laws 1st

Answer 2

a) ∀x∀y∀z((S(x)∧ C(y)∧ E(x,y)) → (C(z) ∧ R(z,y) → P(x,z)))

b) ∃x∃y∀z((S(x)∧ C(y) ∧ E(x,y)) ∧ (C(z) ∧ E(x,z) → y=z))

c) ∀x∀y∀z(C(y) ∧ S(x) ∧ P(x,y) → (C(z) ∧ R(z,y) → P(x,z)))

d) ∃x∃y(S(x) ∧ C(y) ∧ E(x,y) ∧ ¬ P(x,y))

e)∃y∀x(C(y)∧ (S(x) → ¬ P(x,y)))

f)∀y∃x(S(x) ∧ C(y) → (E(x,y) ∨ P(x,y)))

Answer 3

1	p →(q ∨ r)	*premise*
2	¬r ∧ ¬s	*premise*
3	q → s	*premise*
4	¬r	∧*e,2*
5	¬s	∧*e,2*
6	q	*assumed*
7	s	→*e, 3,6*
8	⊥	¬*e, 5,7*
9	¬ q	¬i, 6-8
10	p	assumed
11	q∨r	→*e, 1,10*
12	q	assumed
13	⊥	¬*e, 9,12*
14	r	assumed
15	⊥	¬*e, 4,14*
16	⊥	∨e,11,12-13,14-15
17	¬ p	¬ i, 10-16

Answer 4

a)

Premises : ∃x(P(x) ∧ S(x)) , ∀x(P(x)→ K(x))
Claim : ∃x(S(x)∧K(x))

b)

1	∃x(P(x) ∧ S(x))	*premise*
2	∀x(P(x)→ K(x))	*premise*
3	P(c) ∧ S(c)	*assumed*
4	P(c)	∧*e, 3*
5	S(c)	∧*e, 3*
6	P(c)→K(c)	∀*e, 2*
7	K(c)	→*e, 4,6*
8	S(c)∧ K(c)	∧*i, 5,7*
9	∃x(S(x)∧K(x))	∃*i, 8*
10	∃x(S(x)∧ K(x))	∃*e, 1,3-9*