Student Information

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Answer 1

a-)

p	q	¬q	p → q	p ∧ ¬q	(p → q) ⊕ (p ∧ ¬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**

- For every possible value of p and q, the statement (p → q) ⊕ (p ∧ ¬q) is evaluated True. So the this statement is a **Tautology**.

b-)

$p \to ((q \vee \neg p) \to r)$	
$\neg p \vee ((q \vee \neg p) \to r)$	Table-7, first rule, Implication elimination
$\neg p \vee (\neg(q \vee \neg p) \vee r)$	Table-7, first rule, Implication elimination
$(\neg p \vee \neg(q \vee \neg p)) \vee r$	Table-6, Associative Rule
$(\neg p \vee (\neg q \wedge p)) \vee r$	Table-6, De Morgan's Laws
$((\neg p \vee \neg q) \wedge (\neg p \vee p)) \vee r$	Table-6, Distributive laws
$((\neg p \vee \neg q) \wedge T) \vee r$	Table-6, Negation laws
$(\neg p \vee \neg q) \vee r$	Table-6, Identity Laws
$\neg(\neg p \vee \neg q) \to r$	Table-7, third rule, Implication introduction
$(p \wedge q) \to r$	Table-6, De Morgan's Laws

c-)

1. F
2. F
3. F
4. T
5. T

Answer 2

1. $\exists$x(P(Can,x) $\wedge$ T(x,L))
2. $\forall$x$\exists$y(T(x,S) $\rightarrow$ (P(y,x) $\wedge$ N(y,Turkish)))
3. $\forall$x$\exists$y$\forall$z((T(x,S) $\wedge$ T(y,S) $\wedge$ T(z,S) $\wedge$ R(x,z) $\wedge$ R(x,y)) $\rightarrow$ (y=z))
4. $\forall$x$\forall$y((N(y,English) $\wedge$ P(y,x)) $\rightarrow$ $\neg$W(M,x))
5. $\exists$x$\exists$y$\forall$z(P(x,G) $\wedge$ P(y,G) $\wedge$ N(x,Turkish) $\wedge$ N(y,Turkish) $\wedge$ x$\neq$y $\wedge$ ((P(z,G) $\wedge$ N(z,Turkish)) $\rightarrow$ (x=z $\vee$ y=z)))
6. $\exists$x$\exists$y$\exists$z(T(x,y) $\wedge$ T(x,z) $\wedge$ y$\neq$z)

Answer 3

1.	p $\rightarrow$ q	Premise
2.	(r $\wedge$ s) $\rightarrow$ p	Premise
3.	r $\wedge$ $\neg$q	Premise
4.	r	$\wedge$e, 3
5.	s	Assumed
6.	r $\wedge$ s	$\wedge$i, 4, 5
7.	p	$\rightarrow$e, 2, 6
8.	q	$\rightarrow$e, 1, 7
9.	$\neg$q	$\wedge$e, 3
10.	$\perp$	$\neg$e, 8, 9
11.	$\neg$s	$\neg$i, 5-10

Answer 4

a-)

- $\exists$x(P(x) $\rightarrow$ S(x)) **Premise 1**
- $\forall$xP(x) **Premise 2**

- $\exists x S(x)$ **Claim**

b-)

1. $\exists x(P(x) \rightarrow S(x))$	Premise
2. $\forall x P(x)$	Premise
3. $P(c) \rightarrow S(c)$	Assumed
4. $P(c)$	$\forall x$e, 2
5. $S(c)$	$\rightarrow$e, 3, 4
6. $\exists x S(x)$	$\exists$i, 5
7. $\exists x S(x)$	$\exists$e, 1, 3-6