Homework 2

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1 Knowledge Representations

1. Let p = It is cloudy, Let q = It is raining: q → p.
2. Let p = I like to eat apples, Let q = I like to eat bananas: p ∧ q.
3. Let p = Behind the clouds, Let q = The sun is shining: q → p.
4. Let p = The function is differentiable, Let q = The function is continuous: p → q.
5. Let p = I will study for the final, Let q = I will fail the final: then ¬p → q.

2 Equivilance in Propositional Logic

1.

p	q	$\neg q$	$p \wedge q$	$p \vee \neg q$	$(p \wedge q) \leftrightarrow (p \vee \neg q)$
0	0	1	0	1	0
0	1	0	0	0	1
1	0	1	0	1	0
1	1	0	1	1	1

The statements p ∧ q and p ∨ ¬q are not equivilant because all cases are not true in the final column.

2.

p	q	$\neg p$	$\neg q$	$p \vee q$	$\neg p \vee \neg q$	$(p \vee q) \leftrightarrow (\neg p \vee \neg q)$
0	0	1	1	0	1	0
0	1	1	0	1	1	1
1	0	0	1	1	1	1
1	1	0	0	1	0	0

The statements p ∨ q and ¬p ∨ ¬q are not equivilant because all cases are not true in the final column.

3.

p	q	$\neg p$	$\neg q$	$p \rightarrow q$	$\neg q \rightarrow \neg p$	$(p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$
0	0	1	1	1	1	1
0	1	1	0	1	1	1
1	0	0	1	0	0	1
1	1	0	0	1	1	1

The statements p → q and ¬q → ¬p are equivilant because all cases are true in the final column.

4.

p	q	$\neg p$	$p \to q$	$\neg p \vee q$	$(p \to q) \leftrightarrow (\neg p \vee q)$
0	0	1	1	1	1
0	1	1	1	1	1
1	0	0	0	0	1
1	1	0	1	1	1

The statements p $\to$ q and $\neg$p $\vee$ q are equivilant because all cases are true in the final column.

5.

p	q	$\neg p$	$\neg q$	$\neg(p \wedge q)$	$\neg p \vee \neg q$	$\neg(p \wedge q) \leftrightarrow (\neg p \vee \neg q)$
0	0	1	1	1	1	1
0	1	1	0	1	1	1
1	0	0	1	1	1	1
1	1	0	0	0	0	1

The statements $\neg$(p $\wedge$ q) and $\neg$p $\vee$ $\neg$q are equivilant because all cases are true in the final column