Week 3 Recitation

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September 7, 2010

- (1 min max) Go over quiz from last week
- (3 min max) Go over homework from last week.
- Questions about lecture / homework so far?
- Guidance for logical proofs:
  1. Write the equivalence to prove.
  2. Start from either the LHS (left hand-side) or the RHS, whichever you are more comfortable with or whichever seems more complex (so you can simplify it).
  3. Put a number on each step starting from zero.
  4. Make sure to put the equivalence sign between a step and the next to clarify the meaning of the transition.
  5. Justify each transition with the name of the equivalence law you have used.
- Questions
  - 1.2:19 $\neg p \leftrightarrow q \equiv p \leftrightarrow \neg q$

Step	**Sentence**	**Equivalence law**
0	$\neg p \leftrightarrow q$	
1	$\equiv \neg p \rightarrow q \wedge q \rightarrow \neg p$	Biconditional law
2	$\equiv (p \vee q) \wedge (\neg q \vee \neg p)$	Implication Law
3	$\equiv (q \vee p) \wedge (\neg p \vee \neg q)$	Commutative Law
4	$\equiv \neg q \rightarrow p \wedge p \rightarrow \neg q$	Implication
5	$\equiv p \leftrightarrow \neg q$	Biconditional law.

– 1.2:21 $\neg(p \leftrightarrow q) \equiv \neg p \leftrightarrow q$

Step	Sentence	Equivalence law
0.	$\neg(p \leftrightarrow q)$	
1.	$\equiv \neg((p \to q) \wedge (q \to p))$	Biconditional law
2.	$\equiv \neg((\neg p \vee q) \wedge (\neg q \vee p))$	Implication Law
3.	$\equiv \neg((\neg p \wedge \neg q) \vee (\neg p \wedge p) \vee (q \wedge \neg q) \vee (q \wedge p))$	Distributive law
4.	$\equiv \neg((\neg p \wedge \neg q) \vee (q \wedge p))$	Domination law
5.	$\equiv (p \vee q) \wedge (\neg q \vee \neg p)$	DeMorgan's Law
6.	$\equiv \neg p \to q \wedge q \to \neg p$	Implication Law
7.	$\equiv \neg p \leftrightarrow q$	Biconditonal Law.

– 1.2:23 $(p \to r) \wedge (q \to r) \equiv (p \vee q) \to r$

Step	Sentence	Equivalence law
0.	$(p \to r) \wedge (q \to r)$	
1.	$\equiv (\neg p \vee r) \wedge (\neg q \vee r)$	Implication Law
2.	$\equiv (\neg p \wedge \neg q) \vee r)$	Distributive law
3.	$\equiv \neg(\neg p \wedge \neg q) \to r$	Implication law
4.	$\equiv (p \vee q) \to r$	DeMorgan's Law.

– 1.2:15 $\neg q \wedge (p \to q)) \to \neg p$ is a tautology

Step	Sentence	Equivalence law
0.	$\neg(\neg q \wedge (p \to q)) \vee \neg p$	
1.	$\equiv \neg(\neg q \wedge (\neg p \vee q)) \vee \neg p$	Implication Law
2.	$\equiv (q \vee (p \wedge \neg q)) \vee \neg p$	DeMorgan's Law
3.	$\equiv ((q \vee p) \wedge (q \vee \neg q)) \vee \neg p$	Distributive Law
4.	$\equiv ((q \vee p)) \vee \neg p$	Domination Law
5.	$\equiv (q \vee (p \vee \neg p))$	Associative Law
6.	$\equiv q \vee T$	Identity Law
7.	$\equiv T$	Identity Law.

- (Last 10 minutes) Give quiz