Problem Set 1

Phil313Q

Due Sept. 6, 9:30am

For practice problems, see TLB p.23 #1-4, p.36 #1-2, p.55 #1, p.76 #2, p.85 #1-2 and the answers in the back of the book.

1 Well-formed Formulas

State whether each of the following are well-formed formulas of SL. For those that are well-formed formulas, circle the main logical connective.

1. $((F \equiv \sim(G\&H_{23})) \vee Q))$
2. $\sim (\sim\sim A \vee (C \supset B))$
3. $((D \equiv D_a))$
4. $(\sim \phi \rightarrow D_{123})$
5. $((D \supset S) \equiv \sim (F \vee S_{12,000})) \vee (\sim S\& \sim E)$
6. $((A \equiv (B\&(\sim C \equiv A))) \supset ((D\&A)\& \sim Z))$

2 Translations into SL

For the questions below, symbolize the simple sentences of English into (atomic) sentence letters of SL, then translate the entire English sentence into SL.

Example: If the Kings win, then Laker fans won't be happy.
K = The Kings win
L = Laker fans will be happy
$(K \supset \sim L)$

1. If Bob went to the park, then it was either sunny or partly cloudy outside.
2. Both Sue and Jim love going to the movies, but neither of them has gone recently.
3. Adam eats an apple only if Eve gives him an apple.

4. You'll get an A in this course provided you do all the readings and never skip lecture.

5. That kid will get a stomach ache unless he takes some medicine, and that kid will not get a stomach ache.

6. Bob loves Sue just in case she is indifferent, unless Bob isn't in a good mood.

7. If John orders orange juice or milk at the diner, but not both, then he just needs one cup.

8. I hate it when it rains, but it never does.

9. Either the Yankees or the Red Sox will win the big game tonight, unless both of their planes crash on the way.

10. The street is wet because it rained last night.

3 Truth-Tables

Construct complete truth-tables for the sentences below. Then state whether each is truth-functionally true, truth-functionally false, or truth-functionally indeterminate.

1. $(A \equiv (\sim A \supset A))$
2. $(\sim (A\& \sim B) \vee (A \equiv B))$
3. $((B \supset \sim\sim B) \vee (\sim A\& \sim\sim A))$
4. $((A \supset (B \equiv (\sim C \equiv A))) \vee ((C\&A)\& \sim B))$
5. $(((A \supset B) \supset (B \supset A)) \supset (\sim A \equiv \sim B))$

4 Putting it all together

Translate each of the arguments below into arguments of SL, then construct a truth-table to determine whether the argument is truth-functionally valid or truth-functionally invalid.

> Example: John really needs milk. If he really needs milk, then either he will go the store or it's raining. It isn't raining. So, John will go to the store.
>
> M = John really needs milk
> S = John will go to the store
> R = It's raining

P1. M
P2. $(M \supset (S \vee R))$
P3. $\sim R$
C. S

M	S	R	M	$(M \supset (S \vee R))$	$\sim R$	S
T	T	T	**T**	T **T** T T T	**F** T	**T**
T	T	F	**T**	T **T** T T F	**T** F	**T**
T	F	T	**T**	T **T** F T T	**F** T	**F**
T	F	F	**T**	T **F** F F F	**T** F	**F**
F	T	T	**F**	F **T** T T T	**F** T	**T**
F	T	F	**F**	F **T** T T F	**T** F	**T**
F	F	T	**F**	F **T** F T T	**F** T	**F**
F	F	F	**F**	F **T** F F F	**T** F	**F**

This argument is truth-functionally valid, because every truth-value assignment (i.e., row) where all the premises are True also has the conclusion as True.

1. Mary will buy a nice car provided that she gets a big bonus. But Mary isn't getting a big bonus. So, she won't buy a nice car.

2. The grocery store is open on either Tuesday or Wednesday, but not both days. If it's open on Tuesday, Sue will buy apples. If it's open on Wednesday, she won't buy apples. So, Sue buys apples unless the store is open on Wednesday.

3. The Yankees win the big game if and only if it's not raining. It's raining only if the temperature is under 90 degrees. So, if the Yankees win the big game, then the temperature isn't under 90 degrees.