

Semantic Theory 2025: Exercise 7

Due by: Wednesday, June 11 at 10:00 am (before class)

Question 1

Recall the syntax for well-formed formulas (WFFs) in Dynamic Predicate Logic (DPL):

- All atomic formulas ($R(t_1, \dots, t_n)$ for $R \in PRED^n$, $t_1, \dots, t_n \in TERM$) are WFFs
- If $x \in VAR$, then $\exists x$ is a WFF
- If ϕ and ψ are WFFs, then $\sim\phi$ and $(\phi \cdot \psi)$ are WFFs
- Nothing else is a WFF

Translate the following natural language utterances into DPL. You may treat underlined expressions as single terms (e.g. “came to” \Rightarrow $come-to(\dots)$):

- “If John runs, he will pull a muscle.”
- “There was a party. A man came to the party. He was hungry.”
- “There is a farmer. She owns a donkey. If the donkey is hungry, she feeds it.”

Question 2

Translate the DPL formulas ϕ you constructed for 1a-c to FOL formulas $\phi^\circ = \langle\phi\rangle\top$, using the rules introduced in the lecture.

- $\langle\perp\rangle\psi = \perp$
- $\langle\top\rangle\psi = \psi$
- $\langle P(x_1, \dots, x_n) \rangle\psi = P(x_1, \dots, x_n) \wedge \psi$
- $\langle\exists x\rangle\psi = \exists x[\psi]$
- $\langle\phi_1 \cdot \phi_2\rangle\psi = \langle\phi_1\rangle(\langle\phi_2\rangle\psi)$
- $\langle\sim\phi\rangle\psi = \neg(\langle\phi\rangle\top) \wedge \psi$

Show each step of the derivation, and indicate the rule applied ((i)-(vi)) at each step:

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