

Ling 130: Homework 6

More lambdas – and language.

Combining PC and lambdas, we can represent

“a student” (equivalently, “some student”) as $\lambda P \exists x (\text{student}(x) \& P(x))$

As we discussed in class, we can use our “conjunction schema” to form a complex predicate “walks and talks”, in lambda form $\lambda x (\text{walks}(x) \& \text{talks}(x))$ from its component parts “walks” $\lambda x \text{walks}(x)$ and “talks” $\lambda x \text{talks}(x)$

1. (a) Write down the translation into the λ -calculus of “A student walks and talks”. This handout already shows the translations of “a student” and “walks and talks”. Put them together by “function-argument application”.

(b) Apply λ -conversion to simplify the formula. There will be two applications, and the resulting formula should have no λ 's.

(c) Write down the translation of “A student walks and a student talks”; simplify by λ -conversion.

(d) The two formulas (if you did parts (a-c) correctly) are not equivalent. Describe a situation (a model) in which one of them is true and the other one is false.

Please indicate types on every expression, including those lambda terms that I gave you; show how the types combine, too!

Optional, just for extra practice/fun:

2. In the predicate calculus, the sentence “No student talks” can be represented as follows:

$\neg \exists x [\text{student}(x) \& \text{talk}(x)]$ or equivalently as $\forall x [\text{student}(x) \rightarrow \neg \text{talk}(x)]$

But in the predicate calculus, there is no way to represent the meaning of the NP “no student”. Using the λ -calculus in the way illustrated above for the NPs “every student”, “a student”, “the king”, write down a translation for the NP “no student”. (There are two logically equivalent correct answers; write down either or both.)