Homework 6

Ling 255

Due: April 8

1. FUNCTION-ARGUMENT FLIP-FLOP

Given the following:

⟦**every**⟧	$\lambda P : P \in D_{\langle e, t\rangle} \,.\, \lambda Q : Q \in D_{\langle e, t\rangle} \,.\, \{x \mid P(x) = \text{TRUE}\} \subseteq \{y \mid Q(y) = \text{TRUE}\}$
⟦**man**⟧	$\lambda x : x \in D_e \,.\, x$ is a man
⟦**woman**⟧	$\lambda x : x \in D_e \,.\, x$ is a woman
⟦**snores**⟧	$\lambda x : x \in D_e \,.\, x$ is snores
⟦**and**⟧	$\lambda X \,.\, \lambda Y \,.\, X \sqcap Y$, where X and Y are variables of a "conjoinable type".

$X \sqcap Y =$	$X \wedge Y$	when X, Y are of type t
	$\lambda x : x \in D_a.\ X(x) \sqcap Y(x)$	when X, Y are of type $\langle a, b\rangle$

and all the usual composition rules, plus:

Function-Argument Flip-Flop
If an expression has a denotation x with type σ, then it also has a denotation

$$\lambda P : P \in D_{\langle \sigma, \tau\rangle} \,.\, P(x)$$

with type $\langle\langle \sigma, \tau\rangle, \tau\rangle$. For instance: ⟦**Katherine**⟧ = Katherine, which is type e, so in addition, ⟦**Katherine**⟧ = $[\lambda P : P \in D_{\langle e, t\rangle} \,.\, P(\text{Katherine})]$, which is type $\langle\langle e, t\rangle, t\rangle$.

Provide a derivation for the interpretation of:

(1) Every man and woman snores.

that gives the right truth conditions (i.e., not truth conditions that refer to hermaphrodites).

Hint: τ is the type you'd usually get out without flip-flop. So function-argument flip-flop on "Katherine" allows something usually of type e, which in subject position usually produces a t by being the argument of an $\langle e, t\rangle$, to instead return t by taking the $\langle e, t\rangle$ as its argument. Thus, if *every* + *man* usually gives an $\langle\langle e, t\rangle, t\rangle$, then that'll be the τ that it should still give after flip-flop is applied.

2. *BELIEVE*

In class, we considered the idea of sets of possible worlds (or world/time pairs), and the idea of being "compatible" with a variety of different worlds.

Consider, then, the following circumstances:

John believes that wizards exist, rather than not.
John believes that grass is green, rather than orange.
John has no beliefs, one way or another, about when Amy Gutmann eats lunch.

And the following worlds (where "TRUE" means that the statement at the top of the column is true in that world, and a dash means it's false; a dash instead of "FALSE" just for the sake of visual distinction).

	Wizards exist.	**Grass is green.**	**Amy Gutmann was eating lunch at noon on 4/3/2008.**
w_1	TRUE	TRUE	TRUE
w_2	TRUE	TRUE	—
w_3	TRUE	—	TRUE
w_4	—	TRUE	TRUE
w_5	TRUE	—	—
w_6	—	TRUE	—
w_7	—	—	TRUE
w_8	—	—	—

Q2.1: What is the set of worlds compatible with what John believes? (That is: what is the set of worlds w such that, if John believes a statement, then that statement is true in w?)

Q2.2: We said that sentences such as *Grass is green* need to have $\langle s, t\rangle$ meanings: that is, they should be sets of worlds (or, functions that return TRUE for some worlds, FALSE for others). What set of worlds is the denotation ⟦*Grass is green*⟧?

Q2.3: Write a denotation for *believe*. That is: we know that *believe* should have the type $\langle\langle s, t\rangle, \langle e, t\rangle\rangle$.[1] That means that its meaning will be:

$$\lambda p : p \in D_{\langle s,\, t\rangle} \,.\, \lambda x : x \in D_e \,.\, [....]$$

What goes in the brackets? That is, it'll be some relation between the set of worlds p and, perhaps, some other set. What is the relation that apparently holds?

[1] ...well, obviously not: it'll actually need to return, in the end, an $\langle s, t\rangle$ and not a t. Ignore that complication, unless you're feeling really, really brave.