

**Homework 2**  
LING 553  
Due: September 31, 2008

**1. FUNCTIONS**

**1.1.** Write the following functions in  $\lambda$ -notation.

- (1) a. the function that takes any individual and returns 1 iff that individual is male  
b. the function that takes any integer and returns its square  
c. the function that takes any human being and returns his/her mother.

**1.2.** Give the results of each of the following instances of function application.

- (2) a. Applying your function from (1a) to yourself.  
b. Applying your function from (1b) to 5.  
c. Applying your function from (1c) to Liza Minnelli

**1.3.** Give the types of the following functions:

- (3) a. that function from individuals to truth values such that it maps an individual to TRUE if and only if that individual snores  
b.  $\lambda P : P \in D_{\langle e, t \rangle} . [\lambda Q : Q \in D_{\langle e, t \rangle} . [\text{TRUE iff } \{x \mid P(x)\} \cap \{x \mid Q(x)\} = \emptyset]]$   
c.  $\lambda f : f \in D_{\langle \langle e, t \rangle, \langle e, t \rangle \rangle} . \lambda g : g \in D_{\langle e, t \rangle} . \text{the individual } x \text{ such that } f(g(x)) \text{ is true}$

**2.  $\lambda$ -CONVERSION**

Simplify the following expressions:

- (4) a.  $[\lambda x . x + 2](3)$   
b.  $[\lambda x : x \in D_e . x \text{ loves } x\text{'s mother}](\text{John})$   
c.  $[\lambda f : f \in D_{\langle e, t \rangle} . [\lambda x : x \in D_e . f(\text{the vice-president of } x)]](\lambda y : y \in D_e . y \text{ is a Republican})(\text{George W. Bush})$   
d.  $[\lambda x : x \in D_e . [\lambda y : y \in D_e . \{z \mid z \text{ is the daughter of } x \text{ and } y\}]](\text{Homer Simpson})(\text{Marge Simpson})$   
e.  $[\lambda x : x \in D_e . [\lambda y : y \in D_e . y \text{ hates } x]](\text{John})$

### 3. DERIVATIONS

Write out derivations for  $\llbracket \text{Tony is a male syntactician} \rrbracket$ , using:

- (5) a. an  $\langle e, t \rangle$  meaning for **male** and the rule of PM  
b. an  $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$  meaning for **male**

### 4. THE MOTHER FUNCTOR

Consider the following three sentences:

- (6) a. Goldie is a mother.  
b. Goldie is Kate's mother.  
c. Kate's mother snores.

Suppose that  $\llbracket \text{mother} \rrbracket$  is the function you wrote down in (1c), above.<sup>1</sup> Give the interpretation for these sentences, using our standard assumptions that *is* and *a* can be ignored, along with the assumption that 's can be ignored as well. If the sentences turn out to be uninterpretable (hint: at least one should), indicate where (and why) the derivation fails, and speculate on what changes in meaning or composition might help.

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<sup>1</sup> If you're worried, come and ask me if your answer to (1c) is right.