1 Warm-up

1. Give the semantic type of each of the following functions expressed in lambda notation. Some of these might not correspond to an actual linguistic expression, but are functions nonetheless. (d = Albus Dumbledore)

   (a) $\lambda z[BUBOTUBER(z)]$ $\langle e, t\rangle$

   (b) $\lambda y[\lambda x[HEX(x, y)]]$ $\langle e, \langle e, t\rangle\rangle$

   (c) $\exists x[QUAFFLE(x)\ \&\ RED(x)]$ t

   (d) $\lambda x[IMPRESS(x, d)]$ $\langle e, t\rangle$

   (e) d e

   (f) $\lambda x[d]$ $\langle e, e\rangle$

2. Give the denotation of the underlined word in lambda notation. State the semantic type of it as well.

   (a) Fred coughed $\lambda x[COUGH(x)]$ (type $\langle e, t\rangle$)

   (b) Rupert is a dog $\lambda x[DOG(x)]$ (type $\langle e, t\rangle$)

   (c) Peter saw Katrina $\lambda x[\lambda y[SEE(y, x)]]$ (type $\langle e, \langle e, t\rangle\rangle$)

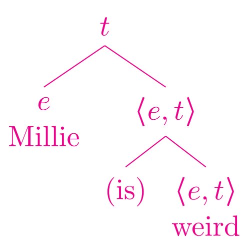
   (d) Bob is in Tokyo $\lambda x[\lambda y[IN(y, x)]]$ (type $\langle e, \langle e, t\rangle\rangle$)

3. Give a full lambda computation of the following sentences, including a tree annotated with types, the lexical entries (i.e., give me the denotation of each word, using lambda notation where needed), and a step-by-step computation. You can ignore tense, and you can treat a, *is*, and *of* as meaningless.

   (a) Millie is weird

   $[\![\text{Millie}]\!] = m$

   $[\![\text{weird}]\!] = \lambda x[\text{WEIRD}(x)]$



   $[\![\text{Millie (is) weird}]\!]$

   i. $= [\![\text{weird}]\!]([\![\text{Millie}]\!])$

   ii. $= [\![\text{weird}]\!](m)$

   iii. $= \lambda x[\text{WEIRD}(x)](m)$

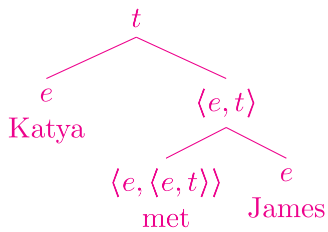
   iv. $=$ T iff WEIRD(m)

(b) Katya met James

$[\![\text{Katya}]\!] = k$

$[\![\text{James}]\!] = j$

$[\![\text{meet}]\!] = \lambda x[\lambda y[\text{MEET}(y, x)]]$



$[\![\text{Katya met James}]\!]$

i. $[\![\text{met James}]\!]$
   A. $= [\![\text{meet James}]\!]$
   B. $= [\![\text{meet}]\!]([\![\text{James}]\!])$
   C. $= [\![\text{meet}]\!](j)$
   D. $= \lambda x[\lambda y[\text{MEET}(y, x)]](j)$
   E. $= \lambda y[\text{MEET}(y, j)]$

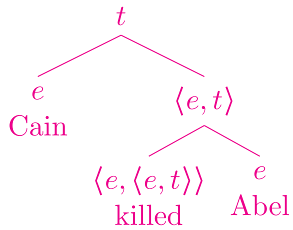
ii. $[\![\text{Katya met James}]\!]$
   A. $= [\![\text{Katya meet James}]\!]$
   B. $= [\![\text{meet James}]\!]([\![\text{Katya}]\!])$
   C. $= [\![\text{meet James}]\!](k)$
   D. $= \lambda y[\text{MEET}(y, j)](k)$
   E. $= \text{T iff MEET}(k, j)$

(c) Cain killed Abel

$\llbracket \text{Cain} \rrbracket = c$

$\llbracket \text{Abel} \rrbracket = a$

$\llbracket \text{kill} \rrbracket = \lambda x[\lambda y[\text{KILL}(y, x)]]$



$\llbracket \text{Cain killed Abel} \rrbracket$

i. $\llbracket \text{killed Abel} \rrbracket$
   A. $= \llbracket \text{kill Abel} \rrbracket$
   B. $= \llbracket \text{kill} \rrbracket (\llbracket \text{Abel} \rrbracket)$
   C. $= \llbracket \text{kill} \rrbracket (a)$
   D. $= \lambda x[\lambda y[\text{KILL}(y, x)]](a)$
   E. $= \lambda y[\text{KILL}(y, a)]$

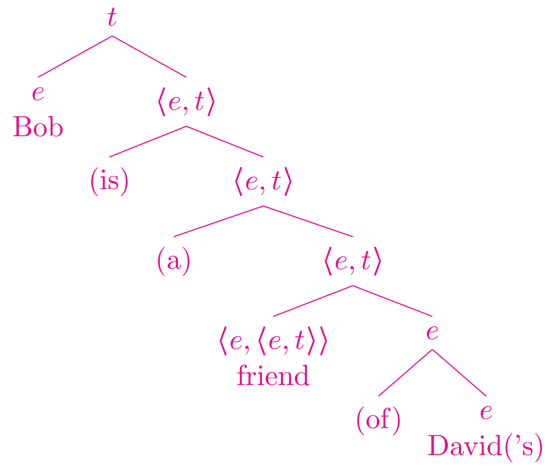
ii. $\llbracket \text{Cain killed Abel} \rrbracket$
   A. $= \llbracket \text{Cain kill Abel} \rrbracket$
   B. $= \llbracket \text{kill Abel} \rrbracket (\llbracket \text{Cain} \rrbracket)$
   C. $= \llbracket \text{kill Abel} \rrbracket (c)$
   D. $= \lambda y[\text{KILL}(y, a)](c)$
   E. $= \text{T iff KILL}(c, a)$

(d) Bob is a friend of David('s)

⟦Bob⟧ $= b$

⟦David⟧ $= d$

⟦friend⟧ $= \lambda x[\lambda y[\text{FRIEND}(y, x)]]$



⟦Bob (is) (a) friend (of) David('s)⟧

i. ⟦(is) (a) friend (of) David('s)⟧
  (A. = ⟦friend David⟧) [you can show this step if you want]
  B. = ⟦friend⟧(⟦David⟧)
  C. = ⟦friend⟧(d)
  D. $= \lambda x[\lambda y[\text{FRIEND}(y, x)]](d)$
  E. $= \lambda y[\text{FRIEND}(y, d)]$

ii. ⟦Bob (is) (a) friend (of) David('s)⟧
  (A. ⟦Bob friend David ⟧)
  B. = ⟦(is) (a) friend (of) David('s)⟧(⟦Bob⟧)
  C. = ⟦(is) (a) friend (of) David('s)⟧(b)
  D. $= \lambda y[\text{FRIEND}(y, d)](b)$
  E. = T iff $\text{FRIEND}(b, d)$

2 Truth tables

Look at ya notes

3 Quantifier ambiguity

Which one means what?

1. $\exists x[SPELL(x)\ \&\ \forall y[STUDENT(y) \rightarrow LEARN(y, x)]]$

   There's ONE unique spell (e.g., *lumos*). Every student learned this spell (e.g., every student learned *lumos*).

2. $\forall x[STUDENT(x) \rightarrow \exists y[SPELL(y) \& LEARN(x, y)]]$

   For every student, there was a spell they they learned. This spell is potentially different for each student. (e.g., Harry learned *lumos*, Hermione learned *wingardium leviosa*, Ron learned *accio*, etc.)