

COGS543 Assignment 4

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Question 1:

$$\begin{array}{ccccccc}
 \text{John} & \text{believes} & \text{that} & \text{every} & \text{man} & \text{likes} & \text{Mary} \\
 S/(S \setminus NP) & (S \setminus NP)/S & S/S & (S/(S \setminus NP))/N & N & (S \setminus NP)/NP & NP \\
 \lambda p.p.john' & \lambda x\lambda y\lambda w.believes'_w xy & \lambda p.p & \lambda p\lambda q\forall x.(px) \rightarrow (qx) & \lambda x.man'x & \lambda x\lambda y\lambda s.likes'_s xy & \lambda p.mary'x \\
 \langle\langle e, \langle s, t \rangle \rangle, t\rangle & \langle t, \langle e, \langle s, t \rangle \rangle \rangle & \langle t, t \rangle & \langle\langle e, t \rangle, \langle\langle e, \langle s, t \rangle \rangle, t\rangle\rangle & \langle e, t \rangle & \langle e, \langle e, \langle s, t \rangle \rangle \rangle & e
 \end{array}$$

$$\begin{array}{c}
 \xrightarrow{\quad} > \\
 S/(S \setminus NP) & S \setminus NP \\
 \lambda q\forall x.(man'x) \rightarrow (qx) & \lambda y\lambda s.likes'_s mary'y \\
 \langle\langle e, \langle s, t \rangle \rangle, t\rangle & \langle e, \langle s, t \rangle \rangle \\
 \xrightarrow{\quad} > \\
 S & \\
 \forall x.(man'x) \rightarrow (likes'_s mary'x) & \\
 t & \\
 \xrightarrow{\quad} > \\
 S & \\
 \forall x.(man'x) \rightarrow (likes'_s mary'x) & \\
 t & \\
 \xrightarrow{\quad} > \\
 S \setminus NP & \\
 \lambda y\lambda w.believes'_w (\forall x.(man'x) \rightarrow (likes'_s mary'x))y & \\
 \langle e, \langle s, t \rangle \rangle & \\
 \xrightarrow{\quad} > \\
 S & \\
 believes'_w (\forall x.(man'x) \rightarrow (likes'_s mary'x))john' & \\
 t &
 \end{array}$$

Question 2:

$$\begin{array}{c}
\begin{array}{ccccc}
\text{John} & \text{believes} & \text{that} & \text{Mary} & \text{may} & \text{leave} \\
S/(S \setminus NP) & (S \setminus NP)/S & S/S & S/(S \setminus NP) & (S \setminus NP)/(S \setminus NP) & S \setminus NP \\
\lambda p.p.\text{john}' & \lambda x\lambda y\lambda w.\text{believes}'_s xy & \lambda p.p & \lambda p.\text{mary}'x & \lambda p\lambda x\exists w.O_{wspk'} \wedge pxw & \lambda x\lambda w.\text{leave}'_w x \\
\langle\langle e, \langle s, t \rangle \rangle, t\rangle & \langle t, \langle e, \langle s, t \rangle \rangle \rangle & \langle t, t \rangle & \langle\langle e, \langle s, t \rangle \rangle, t\rangle & \langle\langle e, \langle s, t \rangle \rangle, \langle e, \langle s, t \rangle \rangle \rangle & \langle e, \langle s, t \rangle \rangle
\end{array} \\
\\
\begin{array}{c}
\text{---} > \\
S \setminus NP \\
\lambda x\exists w.O_{wspk'} \wedge \text{leave}'_w x \\
\langle e, \langle s, t \rangle \rangle
\end{array} \\
\\
\text{---} > \\
S \\
\exists w.O_{wspk'} \wedge \text{leave}'_w \text{mary}' \\
t
\end{array} \\
\\
\text{---} > \\
S \\
\exists w.O_{wspk'} \wedge \text{leave}'_w \text{mary}' \\
t
\end{array} \\
\\
\text{---} > \\
S \setminus NP \\
\lambda y\lambda s.\text{believes}'_s (\exists w.O_{wspk'} \wedge \text{leave}'_w \text{mary}')y \\
\langle e, \langle s, t \rangle \rangle
\end{array} \\
\\
\text{---} > \\
S \\
\text{believes}'_s (\exists w.O_{wspk'} \wedge \text{leave}'_w \text{mary}') \text{john}' \\
t
\end{array}$$