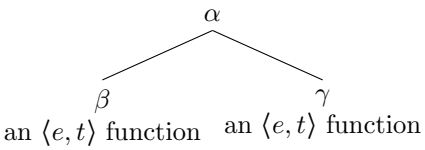
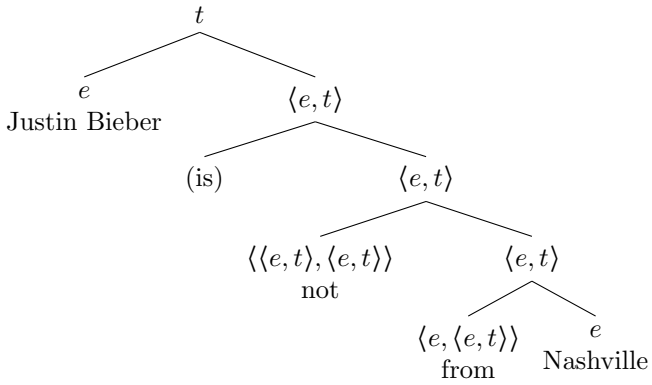
Solution

(1) *Predicate Modification (PM):* If α is a branching node, $\{\beta, \gamma\}$ is the set of α's daughters, and $[\![\beta]\!]$ and $[\![\gamma]\!]$ are both type $\langle e,t\rangle$, then

$[\![\alpha]\!] = \lambda x[\ [\![\beta]\!](x)\ \&\ [\![\gamma]\!](x)\ ]$



1. Justin Bieber is not from Nashville



$[\![\text{Justin Bieber}]\!] = \mathbf{b}$

$[\![\text{Nashville}]\!] = \mathbf{n}$

$[\![\text{from}]\!] = \lambda y[\lambda z[\mathbf{from}(z, y)]]$

$[\![\text{not}]\!] = \lambda g_{\langle e,t\rangle}[\lambda y'[\neg g(y')]]$

$[\![\text{from Nashville}]\!]$

$= [\![\text{from}]\!]([\![\text{Nashville}]\!])$
$= [\![\text{from}]\!](\mathbf{n})$
$= \lambda y[\lambda z[\mathbf{from}(z, y)]](\mathbf{n})$
$= \lambda z[\mathbf{from}(z, \mathbf{n})]$

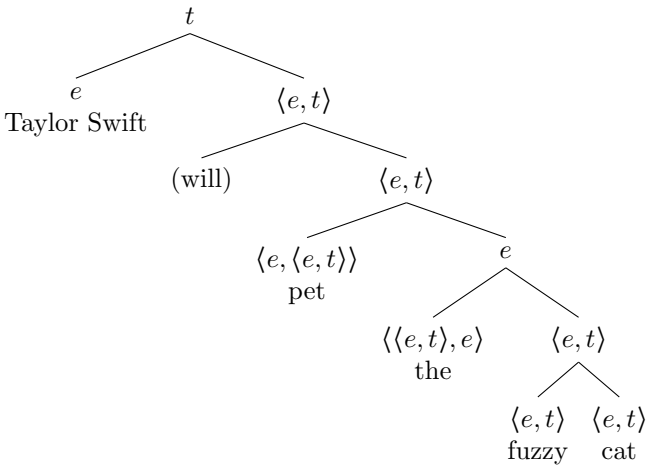
$[\![\text{not from Nashville}]\!]$

$= [\![\text{not}]\!]([\![\text{from Nashville}]\!])$
$= \lambda g_{\langle e,t\rangle}[\lambda y'[\neg g(y')]]([\![\text{from Nashville}]\!])$
$= \lambda y'[\neg [\![\text{from Nashville}]\!](y')]$
$= \lambda y'[\lambda z[\neg \mathbf{from}(z, \mathbf{n})](y')]$
$= \lambda y'[\neg \mathbf{from}(y', \mathbf{n})]$

$[\![\text{Justin Bieber is not from Nashville}]\!]$

$= [\![\text{not from Nashville}]\!]([\![\text{Justin Bieber}]\!])$
$= [\![\text{not from Nashville}]\!](\mathbf{b})$
$= \lambda y'[\neg \mathbf{from}(y', \mathbf{n})](\mathbf{b})$
$=$ T iff $\neg \mathbf{from}(\mathbf{b}, \mathbf{n})$

2. Taylor Swift will pet the fuzzy cat



$[\![\text{Taylor Swift}]\!] = \mathbf{t}$
$[\![\text{fuzzy}]\!] = \lambda x[\mathbf{fuzzy}(x)]$
$[\![\text{cat}]\!] = \lambda y[\mathbf{cat}(y)]$
$[\![\text{pet}]\!] = \lambda x'[\lambda y'[\mathbf{pet}(y', x')]]$
$[\![\text{the}]\!] = \lambda f_{\langle e,t\rangle}[\iota z'[f(z')]]$

$[\![\text{fuzzy cat}]\!]$

$= \lambda z[[\![\text{fuzzy}]\!](z)\ \&\ [\![\text{cat}]\!](z)]$ (via PM rule)
$= \lambda z[\lambda x[\mathbf{fuzzy}(x)](z)\ \&\ [\![\text{cat}]\!](z)]$
$= \lambda z[\mathbf{fuzzy}(z)\ \&\ [\![\text{cat}]\!](z)]$
$= \lambda z[\mathbf{fuzzy}(z)\ \&\ \lambda y[\mathbf{cat}(y)](z)]$
$= \lambda z[\mathbf{fuzzy}(z)\ \&\ \mathbf{cat}(z)]$

$[\![\text{the fuzzy cat}]\!]$

$= [\![\text{the}]\!]([\![\text{fuzzy cat}]\!])$
$= \lambda f_{\langle e,t\rangle}[\iota z'[f(z')]]([\![\text{fuzzy cat}]\!])$
$= \iota z'[[\![\text{fuzzy cat}]\!](z')]$
$= \iota z'[\lambda z[\mathbf{fuzzy}(z)\ \&\ \mathbf{cat}(z)](z')]$
$= \iota z'[\mathbf{fuzzy}(z')\ \&\ \mathbf{cat}(z')]$
$= \mathbf{c}$

$[\![\text{pet the fuzzy cat}]\!]$

$= [\![\text{pet}]\!]([\![\text{the fuzzy cat}]\!])$
$= [\![\text{pet}]\!](\mathbf{c})$
$= \lambda x'[\lambda y'[\mathbf{pet}(y', x')]](\mathbf{c})$
$= \lambda y'[\mathbf{pet}(y', \mathbf{c})]$

$[\![\text{Taylor Swift will pet the fuzzy cat}]\!]$

$= [\![\text{pet the fuzzy cat}]\!]([\![\text{Taylor Swift}]\!])$
$= [\![\text{pet the fuzzy cat}]\!](\mathbf{t})$
$= \lambda y'[\mathbf{pet}(y', \mathbf{c})](\mathbf{t})$
$=$ T iff $\mathbf{pet}(\mathbf{t}, \mathbf{c})$