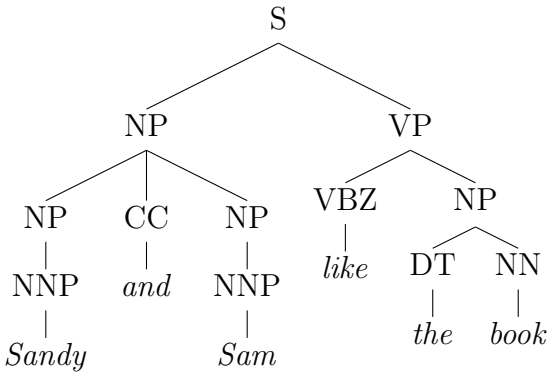
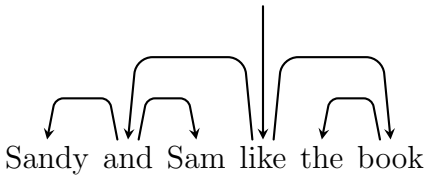
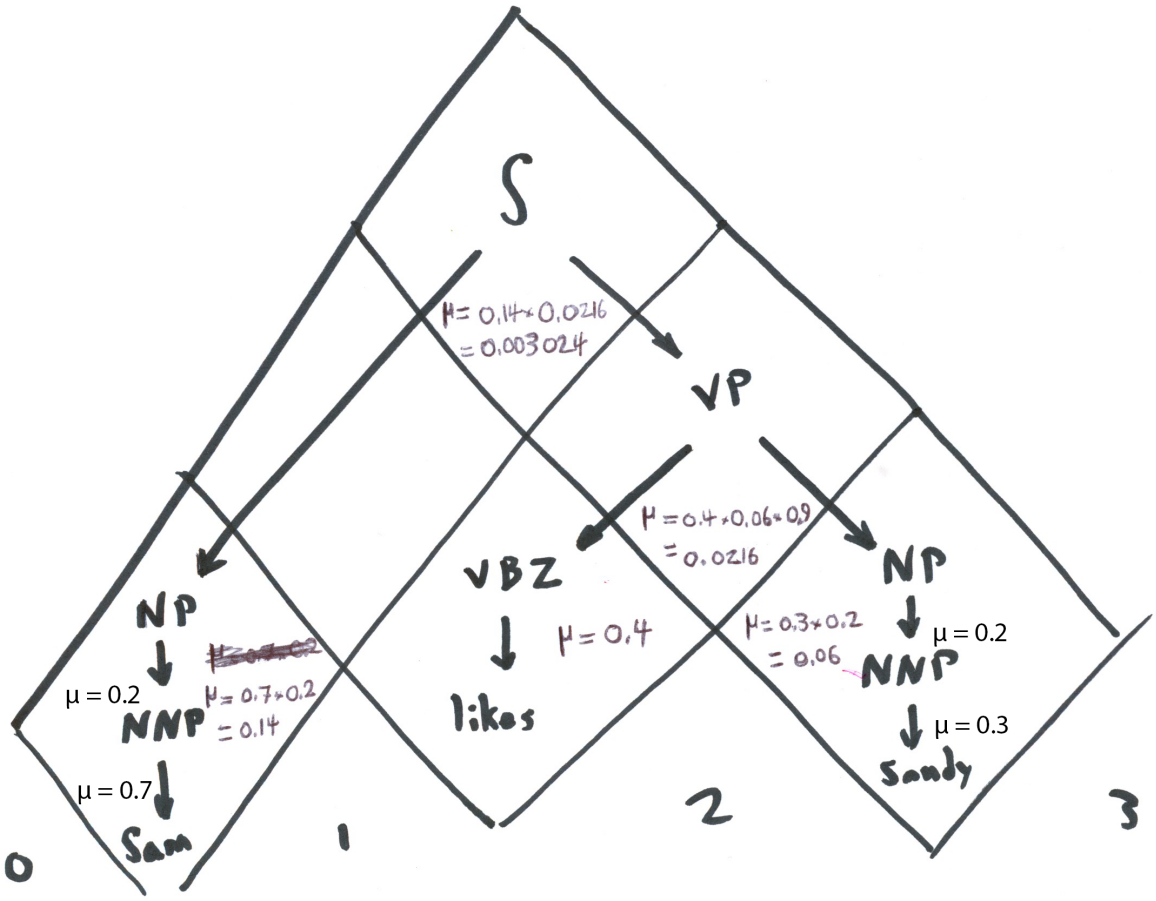
Exercise 4.1



Exercise 4.2



Exercise 4.3



Exercise 4.4

If we assume that the string of N words unambiguously comprises a full sentence, then $P(w_{0,N}) = \beta_{ROOT}(0, N)$. Otherwise, $P(w_{0,N})$ equals neither $\beta_{ROOT}(0, N)$ or $\alpha_{ROOT}(0, N)$ because the string of words may not form a full sentence, and so may not be able to be dominated by $ROOT$.

Exercise 4.5

$\alpha_{NOUN}(2, 3) = 1000P(w_{0,N})$
$\beta_{NOUN}(2, 3) = 0.001$