A  Event semantics in the H&K system (8 points)

For this part of the homework, we’re looking at the H&K-style semantic theory that you used in Homework 2, with one additional rule:

- **Predicate modification** (PM): If you combine two things which each denote a property (a function of type \( \alpha \rightarrow t \), for some type \( \alpha \)), the results denotes the conjunction of those two properties: i.e. the property of having both of the two constituent properties.

\[
\text{Recipe: } \lambda x. P(x) \wedge Q(x) \quad \text{Example: } \lambda x. red'(x) \wedge ball'(x)
\]

\[
\begin{align*}
\lambda x. P(x) & \quad \alpha \rightarrow t \\
\lambda x. Q(x) & \quad \alpha \rightarrow t \\
\lambda x. red'(x) & \quad e \rightarrow t \\
\lambda x. ball'(x) & \quad e \rightarrow t
\end{align*}
\]

**A simple version**

Show how we can associate the string in (1a) with the meaning in (1b), using the tree in (2) and the lexical semantic values in (3).

1. a. Brutus stabbed Caesar violently
   b. \( \exists e [\text{stabbing}'(e) \wedge \text{Agent}(e, \text{brutus}') \wedge \text{Patient}(e, \text{caesar}') \wedge \text{violent}'(e)] \)

(2)  
\[
\text{Brutus} \quad \text{stabbed} \quad \text{violently} \\
\text{Caesar}
\]

(3)  
\[
[\text{Brutus}] := \text{brutus}' \quad [\text{stabbed}] := \lambda x. \lambda y. \lambda e. [\text{stabbing}'(e) \wedge \text{Agent}(e, y) \wedge \text{Patient}(e, x)] \\
[\text{Caesar}] := \text{caesar}' \quad [\text{violently}] := \lambda e. \text{violent}'(e)
\]

**A revised version**

As we have seen, there is strong evidence to suggest that ‘stabbed Caesar violently’ is a constituent (unfortunate though this is, since the tree in (2) works so nicely). So ‘stabbed’ must combine with ‘Caesar’ first, and then with ‘violently’ next. This means that the constituent ‘stabbed Caesar’ must be of type \( s \rightarrow t \), in
order to combine with ‘violently’, which leads us to the revised meaning for ‘stabbed’ in (4a) below. This can be made to work if we assume that the sentence contains a “silent element” written $\Theta_{\text{Agent}}$ with the meaning in (4b). Show how.

(4)  
  a. $\text{[stabbed]} := \lambda x. \lambda e. [\text{stabbing}^\prime(e) \land \text{Patient}(e, x)]$
  b. $\text{[\Theta_{\text{Agent}}]} := \lambda x. \lambda e. \text{Agent}(e, x)$

Hints: What you need to do is associate the string in (1a) with the meaning in (1b), using a tree which has ‘stabbed Caesar violently’ as a constituent and the revised meanings in (4). Don’t be daunted by the notion of a “silent element”: it’s just something which appears in our trees that isn’t pronounced (like a trace).

B Traditional X-bar theory (5 points)

1970s style

For each of the NPs in (5), work out whether each of the modifiers is a complement or an adjunct (show the relevant test sentences you used to figure this out) and draw a tree structure for the NP. For now, assume that determiners are the specifiers of NPs, along with Carnie chapter 6. And don’t worry about the internal structure of the parts I have bracketed for you — just draw a triangle over those chunks.

(5)  
  a. the box $[\text{PP of books}] [\text{PP in the corner}]$
  b. the box $[\text{PP of books}]$
  c. the man $[\text{PP in the classroom}]$
  d. a $[\lambda P \text{ large}]$ glass $[\text{PP of water}]$
  e. a cat

On these trees you have drawn, circle all the nodes that can be targeted by the ‘one’-substitution operation.

1980s style

Now draw a new tree for each of the phrases in (5), under the assumption that they are DPs, not NPs (along with Carnie chapter 7). You should not need to do any more tests to investigate the structures.

Circle all the nodes that can be targeted by the ‘one’-substitution operation in these trees. Can we still state the ‘one’-substitution rule such that it applies to all the nodes which have a particular label? You may want to use a slightly different adjunction rule here from what you used above.

C Bare Phrase Structure theory (i.e. 1990s style) (7 points)

More on DPs

Now draw trees for the DPs in (6) using Bare Phrase Structure: nodes should only be labelled N, D, V, P or A, with no bar levels or XP labels; and there should be no “vacuous projections”/“non-branching nodes”.

(6)  
  a. the box $[\text{NP of books}]$
  b. a glass $[\text{NP of water}]$
c. a cat

Using the *relational* definitions in (7), can we state concisely which nodes the ‘one’-substitution operation applies to based on the examples in (6)? If so, give the rule; if not, explain briefly what goes wrong.

(7) a. A **head** is a node that has no children.
   
b. A **maximal projection** is a node which does not have the same label as its parent.
   
c. An **intermediate projection** is a node which is neither a head nor a maximal projection.

**Verb phrases**

Consider the sentences in (8), with trees drawn in Bare Phrase Structure style.¹

(8) a. T
   
   D T
   
   Brutus T V
   
   will V D
   
   stab Caesar

b. T
   
   D T
   
   John T V
   
   will sleep

c. T
   
   D T
   
   John T V D
   
   will V D
   
   give D a book
   
   a Mary

Using the *relational* definitions in (7), can we state concisely which nodes the ‘do so’-substitution operation applies to based on the examples in (8)? If so, give the rule; if not, explain briefly what goes wrong.

¹The structure given here for the sentence in (8c) is ... *ahem*, “simplified”. But it’s good enough for our purposes.
More complex cases

Draw Bare Phrase Structure trees for the DPs in (9) and the sentences in (10). Remember: no bar-levels or XP labels, and no vacuous projections.

(9)  
   a. the box of books in the corner
   b. the man in the classroom
   c. a large glass of water

(10)  
   a. Brutus will [stab Caesar [violently] [with a knife]]
   b. John will [sleep [in his bed]]  
      (NB: ‘his’ is a determiner)

Using the relational definitions in (7):

- can we state concisely which nodes the ‘one’-substitution operation applies to based on all the examples we’ve seen now? If so, give the rule; if not, explain briefly what goes wrong.

- can we state concisely which nodes the ‘do so’-substitution operation applies to based on all the examples we’ve seen now? If so, give the rule; if not, explain briefly what goes wrong.