# Syntactic Theory 09-10: First Revision and Exercises

Antske Fokkens and Yi Zhang
(Partially based on Valia Kordoni's revision questions)

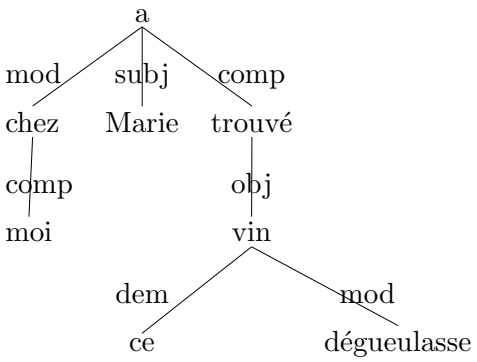
- Dependency Grammars

1. What is a dependency? Name its three formal properties
   **slides 30 and 31, lecture of 27.10.2009**
2. Name two other (typical) properties of dependency representations
   **slides 31 and 32, lecture of 27.10.2009**
3. Phrase Structure representations focus on how surface structure is built up by combining words and phrases. Such representations may capture facts about syntactic relations, because dependents tend to stand close to their head. Which principle referred to in Dependency Grammars captures this property of language?
   **slide 26, lecture of 29.10.2009**
4. Provide a dependency analysis (meaning surface syntactic dependencies) that clearly distinguishes the two readings (reflected in the translation) of the following French sentence:

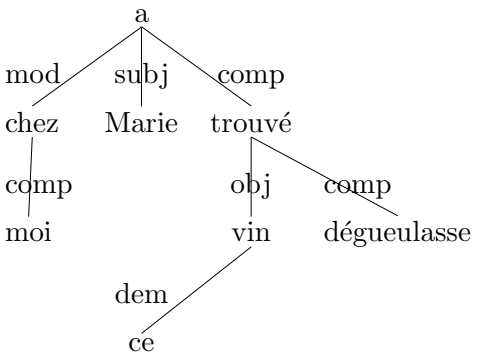
   (1) Chez moi Marie a trouvé ce vin dégueulasse.
   With me Marie has found this wine disgusting
   "At my place, Mary found this disgusting wine"
   "At my place, Mary found this wine disgusting"

**Solution:**

**Reading 1:**




**Reading 2:**



Consider the second reading of the sentence (Mary found this wine disgusting): just like in the first reading "disgusting" says something about "wine". At first sight, it may seem that "wine" is governed by both "disgusting" and "found".

– What answers do Mel'čuk and Hudson respectively provide to this observation? Restrict your answer to one sentence for each solution to this (apparent) violation of "unique headedness".

**Solution:**

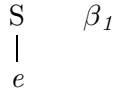
Mel'čuk: syntactically, 'vin' and 'dégueulasse' are only governed by 'trouvé'. The relation between 'vin' and 'dégueulasse' is semantic. Answer: unique headedness is not violated, because the apparent second head-dependent relation is semantic.

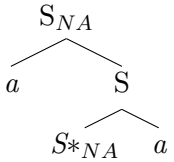
Hudson: these examples can be accounted for by structure sharing, which allows a dependent to have more than one head.

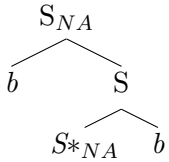
5. Briefly explain how arguments (or actants) can be distinguished from adjuncts (or modifiers) by comparing syntactic and semantic dependencies in Meaning Text Theory.
**Slides 28-30, lecture of 03.11.2009**

- TAG

1. What do EDL and FRD stand for? Briefly explain how they are achieved in the TAG formalism.
**A: TAG3 slide p.3**
2. How is TAG different from TSG from a formal point of view?
**A: TAG1 slide p.18, TAG2 slide p.3,4,6**
3. Propose a TAG that generates exactly the language $\{wew|w \in \{a,b\}^*\}$ (i.e., the so-called copy language, where each sentence is composed of a $e$ in the middle, surrounded by two identical sub-sequences with any number of $a$'s and $b$'s in arbitrary order).

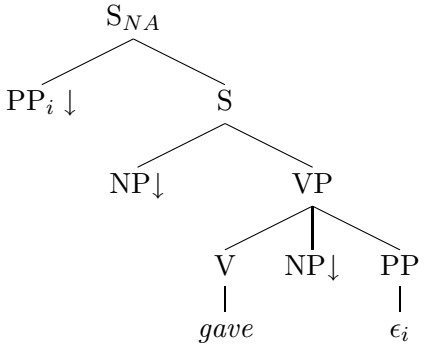
**A:** $\alpha_1$ 

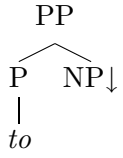
$\beta_1$ 

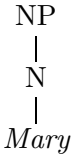
$\beta_2$ 


4. With the given LTAG, draw the the derived tree and derivation tree for the given sentence:

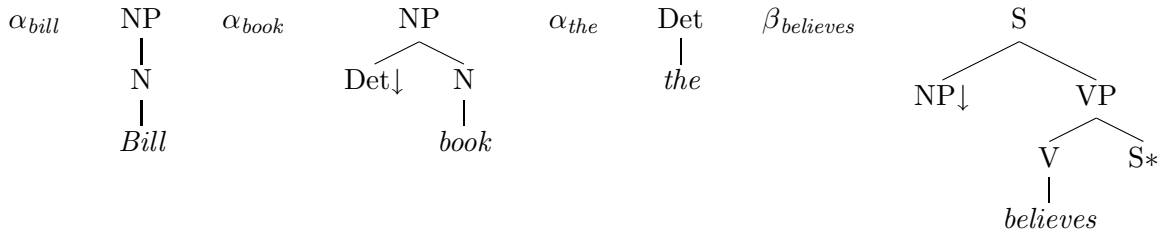
(2) To Mary Bill believes John gave the book.

$\alpha_{gave}$ 

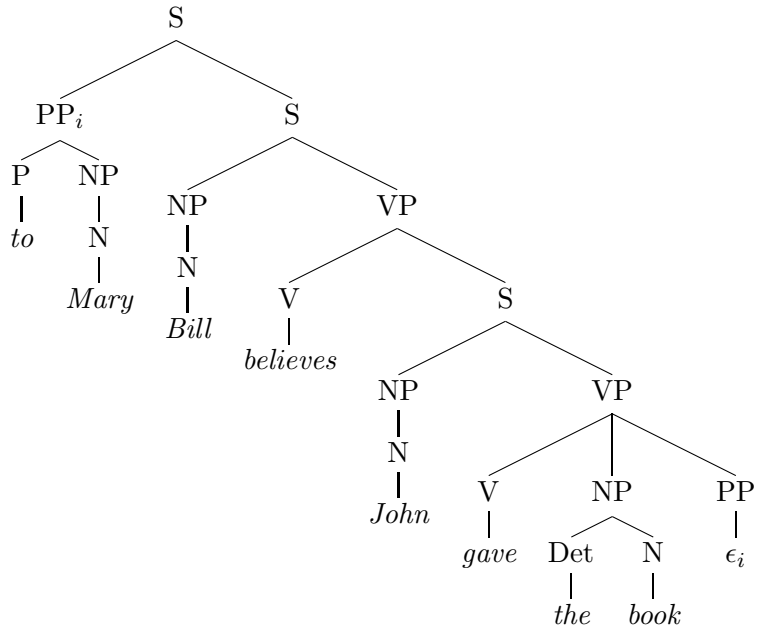
$\alpha_{to}$ 

$\alpha_{mary}$ 

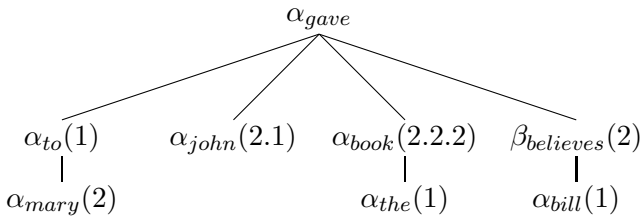
$\alpha_{john}$ 




**A:** Derived tree:



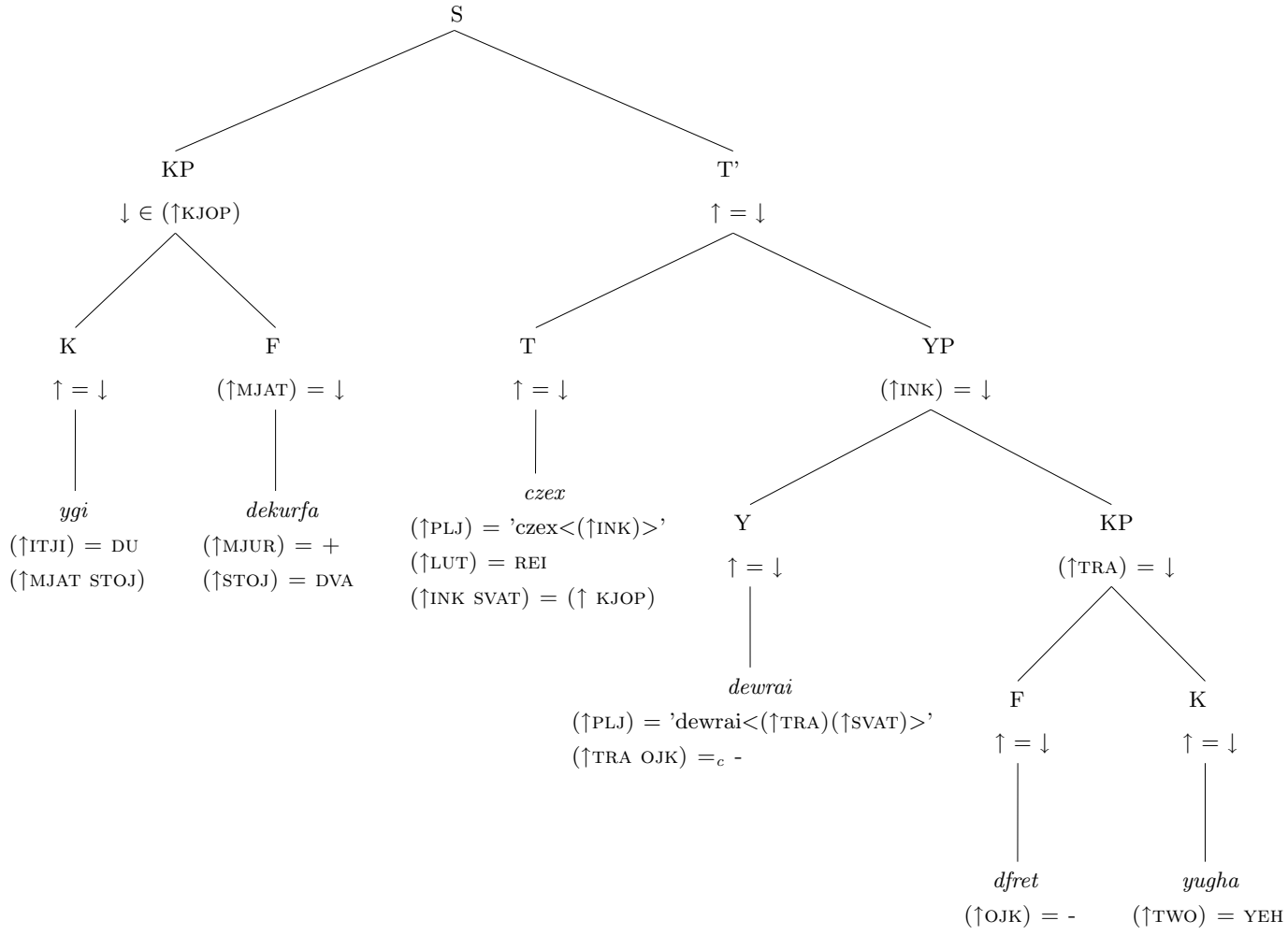

Derivation tree:




- LFG

1. Name the (formally) different representations that LFG uses in order to encode linguistically different kinds of information. Explain briefly what kind of information is represented in each of these different levels of representation.
   **Slide 5, lecture of 19.11.2009**
2. What is the motivation of introducing f-structures? Name two reasons.
   **Slide 9, lecture of 19.11.2009**
3. What is a c-structure and how is it assigned?
   **Slide 19, lecture of 24.11.2009**
4. What is an f-structure and how is the formal description of an appropriate f-structure derived?
   **Slide 12, lecture of 19.11.2009 and slide 30 (and beyond) lecture of 24.11.2009**

5. Which three principles must be respected in a well-formed f-structure? Briefly explain how they restrict the f-structure.
   **Slides 26-31, lecture of 19.11.2009**
6. How are c-structures related to f-structures in LFG?
   **Slide 30, lecture of 24.11.2009**
7. What does $\uparrow = \downarrow$ mean?
   **Slide 32, lecture of 24.11.2009**
8. What do the symbols $\uparrow$ and $\downarrow$ stand for?
   **Slide 32, lecture of 24.11.2009**
9. How can grammatical constraints be integrated in LFG grammars? Name at least three types of constraints and explain in one sentence each what their function is.
   **Slides 32 - 38, lecture of 01.12.2009**
10. What does $\uparrow$ stand for in 'smile<($\uparrow$SUBJ)>'?
    **Slide 37. lecture of 01.12.2009**
11. The c-structure below is part of a theory that uses the same formalism and similar well-formedness constraints as LFG. Derive the f-structure of the expression:




**Solution:**

$$\begin{bmatrix} \text{PLJ} & \text{'czex<(↑ INK)>'} \\ \text{LUT} & \text{REI} \\ \text{INK} & \begin{bmatrix} \text{SVAT} & \\ \text{PLJ} & \text{'dewrai<(↑ TRA )(↑ SVAT )>'} \\ \text{TRA} & \begin{bmatrix} \text{OJK} & \text{-} \\ \text{TWO} & \text{YEH} \end{bmatrix} \end{bmatrix} \\ \text{KJOP} & \left\{ \begin{bmatrix} \text{ITJI} & \text{DU} \\ \text{MJAT} & \begin{bmatrix} \text{MJUR} & + \\ \text{STOJ} & \text{DVA} \end{bmatrix} \end{bmatrix} \right\} \end{bmatrix}$$

12. Provide an LFG-analysis for the following sentence:

    (i) Peter sent flowers to the pretty girl

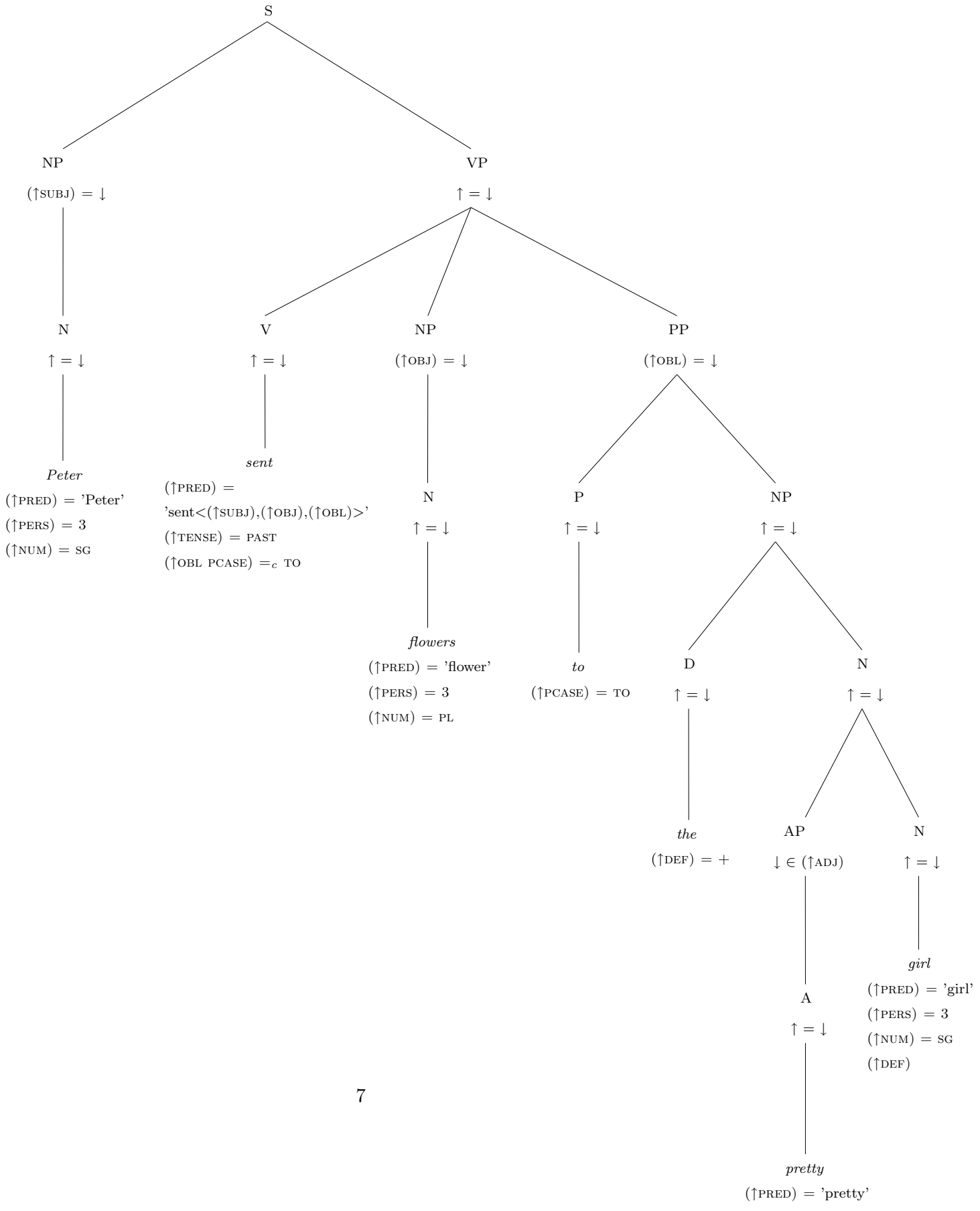
**Solution:**

**Notes:**

(a) An LFG-analysis consists of an annotation c-structure and an f-structure. If no lexicon is provided, information coming from the individual words should be present at the leaves of the c-structure tree.

(b) If you did not know how to restrict (or did not think of restricting) the sentence to get the right preposition, this is okay: in the exam you would probably have gotten this information, or you would have been asked in a separate question to come up with a solution.

(c) c- and f-structure are found in the following pages

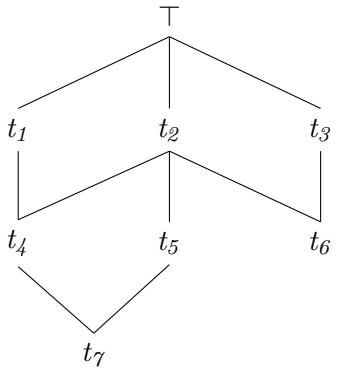

S
NP
(↑SUBJ) = ↓
VP
↑ = ↓
N
↑ = ↓
V
↑ = ↓
NP
(↑OBJ) = ↓
PP
(↑OBL) = ↓
Peter
(↑PRED) = 'Peter'
(↑PERS) = 3
(↑NUM) = SG
sent
(↑PRED) =
'sent<(↑SUBJ),(↑OBJ),(↑OBL)>'
(↑TENSE) = PAST
(↑OBL PCASE) =c TO
N
↑ = ↓
P
↑ = ↓
NP
↑ = ↓
flowers
(↑PRED) = 'flower'
(↑PERS) = 3
(↑NUM) = PL
to
(↑PCASE) = TO
D
↑ = ↓
N
↑ = ↓
the
(↑DEF) = +
AP
↓ ∈ (↑ADJ)
N
↑ = ↓
girl
(↑PRED) = 'girl'
(↑PERS) = 3
(↑NUM) = SG
(↑DEF)
A
↑ = ↓
pretty
(↑PRED) = 'pretty'

**f-structure:**

$$\begin{bmatrix}
\text{PRED} & \text{'sent<(}\uparrow\text{SUBJ),(}\uparrow\text{OBJ),(}\uparrow\text{OBL)>'} \\
\text{TENSE} & \text{PAST} \\
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'Peter'} \\ \text{PERS} & 3 \\ \text{NUM} & \text{SG} \end{bmatrix} \\
\text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'flower'} \\ \text{PERS} & 3 \\ \text{NUM} & \text{PL} \end{bmatrix} \\
\text{OBL} & \begin{bmatrix} \text{PRED} & \text{'girl'} \\ \text{PERS} & 3 \\ \text{NUM} & \text{SG} \\ \text{PCASE} & \text{TO} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{'pretty'} \end{bmatrix} \right\} \end{bmatrix}
\end{bmatrix}$$

- HPSG

1. With the given type hirerachy (already a BCPO), work out the AVM unification results:




(a) $$t_1\begin{bmatrix} \text{F}_1 & \boxed{1} \\ \text{F}_2 \mid \text{F}_3 & \boxed{1} \end{bmatrix} \sqcup t_5\begin{bmatrix} \text{F}_1 \mid \text{F}_2 & \boxed{1} \\ \text{F}_3 & \boxed{1} \end{bmatrix} = t_7\begin{bmatrix} \text{F}_1 & \boxed{1}\begin{bmatrix} \text{F}_2 & \boxed{2} \end{bmatrix} \\ \text{F}_2 \mid \text{F}_3 & \boxed{1} \\ \text{F}_3 & \boxed{2} \end{bmatrix}$$

(b) $$t_1\begin{bmatrix} \text{F}_1 & \boxed{1}\ \text{t}_5 \\ \text{F}_2 & \boxed{1} \end{bmatrix} \sqcup t_4\begin{bmatrix} \text{F}_2 & \boxed{1}\ \text{t}_2 \\ \text{F}_3 & \boxed{1} \end{bmatrix} \sqcup t_5\begin{bmatrix} \text{F}_3 & \text{t}_3 \end{bmatrix} = \bot$$

2. Name at least three main characteristics of HPSG with brief descriptions of what they mean
   **A: HPSG1 slide p.8**
3. What do ID schemata and LP rule determine in HPSG?
   **A: HPSG1 slide p.5**
4. What is the relation between typed feature structures, AVMs and linguistic objects in HPSG?
   **A: TFS slide p.17**
5. What does it mean for a typed feature structure to be *totally well-typed* and *sort-resolved*?
   **A: TFS slide p.17**
6. For which type is the feature *case* defined? And what is the feature path leading to it in an HPSG *sign*?
   **A: HPSG1 slides p.14**
7. In HPSG, is the syntactic head always the same as the semantic head in a headed phrase? If not, please specify when they will be different. And how is this difference described in the HPSG theory?
   **A: HPSG3 slide p.4**

Good luck with your revision!

Have a great Christmas break and a Happy New Year!