

Assignment 6

L445 / L545

Due Wednesday, March 29

1. Determine the set of properties of the following relations on the set of all people. In each case, make the strongest possible statement, e.g., call a relation irreflexive whenever possible instead of nonreflexive.¹

- (a) is a child of
- (b) is a brother of
- (c) is a descendant of
- (d) is an uncle of

2. Using section 12.3.4 as a help and using what you know about English pronouns, write out all the CFG rules you need to capture the following sentences, where * indicates an ungrammatical sentence:

- | | |
|-----------------|---------------------|
| (1) a. I eat. | h. *Him/Her eats. |
| b. *I/Me eats. | i. We eat. |
| c. *Me eat. | j. *We/Us eats. |
| d. You eat. | k. *Us eat. |
| e. *You eats. | l. They eat. |
| f. He/She eats. | m. *They/Them eats. |
| g. *He/She eat. | n. *Them eat. |

3. Using the grammar in figure 13.1 on page 428, provide the following:

- (a) A top-down, depth-first search for *I prefer a meal*.
- (b) A top-down, breadth-first search for *I prefer a meal*.
- (c) A left-corner search for *I prefer a meal*.

The bottom-up search is given for *Book that flight* in figure 13.4 on page 431, which might help you in your answer.

4. [**Moved to next assignment:**] The CYK algorithm can only be used with rules in Chomsky Normal Form (CNF)—i.e., where rules are only of the form $X \rightarrow AB$ or $X \rightarrow w$ ($A, B, X \in N$ and $w \in \Sigma$). Explain where exactly the CYK algorithm would change and how it would be more inefficient if arbitrary CFG rules were allowed.

¹Question adapted from Partee et al (1993), *Mathematical Methods in Linguistics*, ch. 3