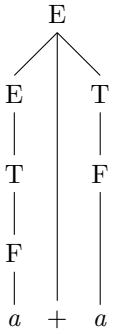
CS 373 Homework 6 Anchu A. Lee
October 7, 2017

1. Exercise 2.1

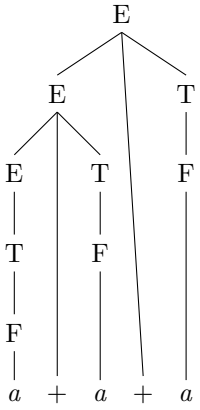
   a. $E \Rightarrow T \Rightarrow F \Rightarrow a$

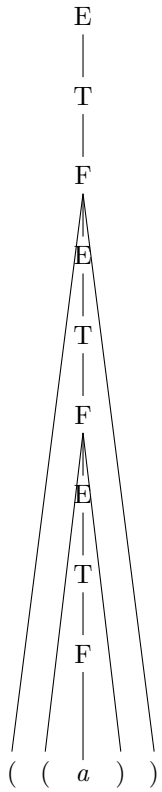
   b. $E \Rightarrow E+T \Rightarrow T+T \Rightarrow F+T \Rightarrow a+T \Rightarrow a+F \Rightarrow a+a$

   c. $E \Rightarrow E+T \Rightarrow E+T+T \Rightarrow T+T+T \Rightarrow T+T+F \Rightarrow T+F+F \Rightarrow F+F+F \Rightarrow F+F+a \Rightarrow F+a+a \Rightarrow a+a+a$

   d. $E \Rightarrow T \Rightarrow F \Rightarrow (E) \Rightarrow (T) \Rightarrow (F) \Rightarrow ((E)) \Rightarrow ((T)) \Rightarrow ((F)) \Rightarrow ((a))$



2. Construct a pushdown automata that recognizes

$$\{w \mid w \in \{0,1\}^* \text{ s.t. the number of 0's in } w = \text{the number of 1's in } w\}$$

3. Exercise 2.2
4. Exercise 2.4b
5. Give a CFG for

$$\{0^a 1^b 2^c 3^d 4^e 5^f \mid \text{such that } a, b, c, d, e, f \geq 0 \text{ and } a + b = d + e\}$$

6. Exercise 2.4e
7. Put the rules following in Chomsky normal form (assume that S is the new start variable)

$$S \to aAA \mid aBC \mid abc$$
$$A \to AA \mid Aa \mid ab$$
$$B \to aaBC \mid BC$$
$$C \to a \mid bc$$

8. Exercise 2.15
9. Show the following is context free using a CFG

$$\{xy \mid x, y \in \{0,1\}^*, |x| = |y|, y \neq x^R\}$$

10. Construct a pushdown automata that recognizes

$$\{w \mid w \text{ is an element of } \{a,b,c,d\}^* \text{ such that the number of a's in } w \text{ plus the number of b's in } w \text{ is equal to the number of c's in } w \text{ plus the number of d's in } w\}$$