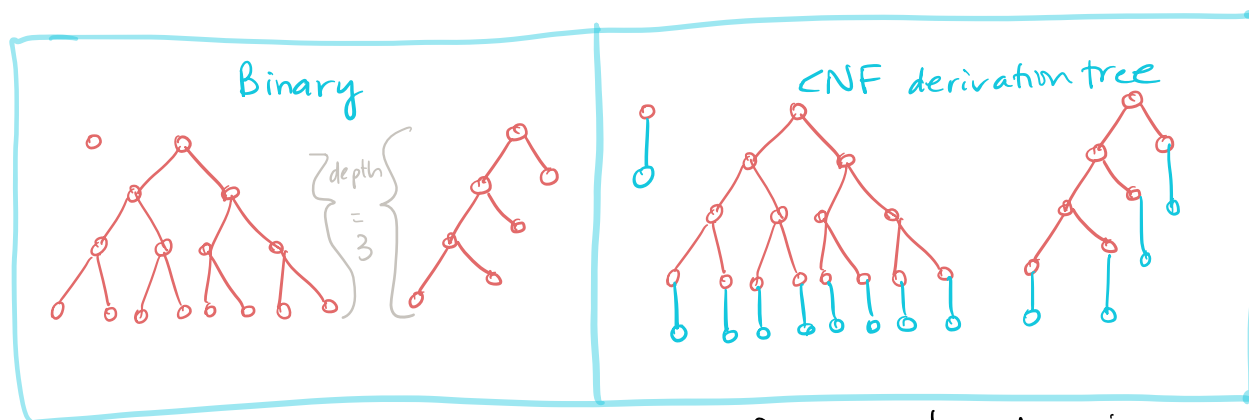


Tutorial - Decidability + Recognizability

(recursive) (recursively enumerable)

- 1.a) What is the maximum depth of a binary tree with n leaves?
- b) What is the maximum depth of a CNF derivation tree with n leaves?



- c) What is the max number of internal nodes in a CNF derivation tree?
- d) What is the max # of steps in the derivation of w , $w \in L(G)$, G in CNF, and $|w| = n$?
2. Is the following language recognizable?

Is it Decidable?

a) $\{ \langle A \rangle \mid A \text{ is a DFA and } L(A) \neq \emptyset \}$

b) $\{ \langle G, w \rangle \mid G \text{ is a context-free grammar and } w \in L(G) \}$

[Hint: first convert the grammar to CNF]

3. Is the set

$$T_{\{0,1\}} = \{ \langle M \rangle \mid M \text{ is a TM over alphabet } \{0,1\} \}$$

countable?

Let us assume $\exists$ a naming convention for states
and for $M \setminus \Sigma$

$$Q = q_0, q_1, q_{10}, q_{11}, \dots \quad h_a, h_r$$

$$\Gamma = \sigma_0, \sigma_1, \sigma_{10}, \dots$$