
Problem 2.46. Consider the following CFG G:

$$S \to SS \mid T$$
$$T \to aTb \mid ab$$

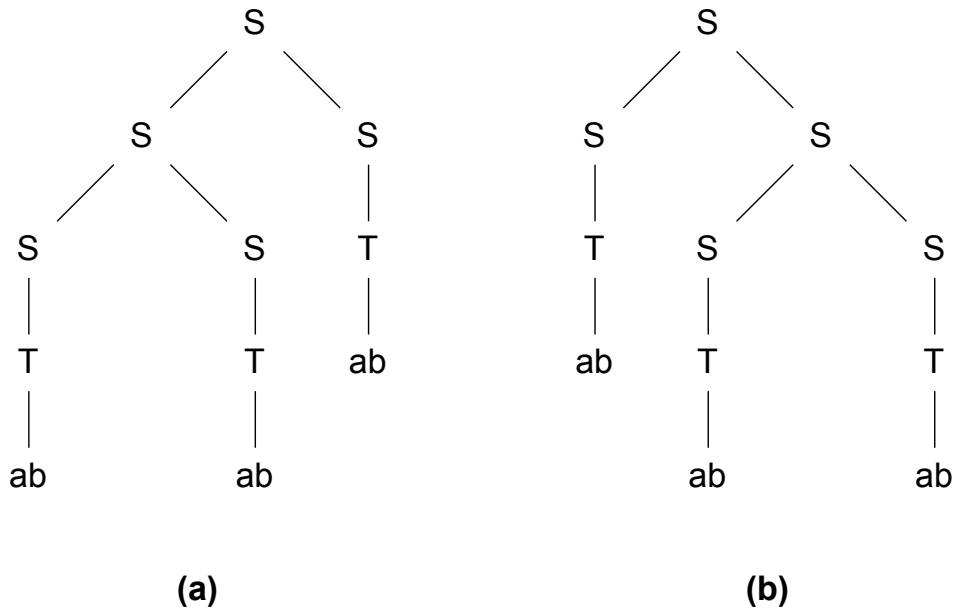
Describe $L(G)$ and show that G is ambiguous. Give an unambiguous grammar H where $L(H) = L(G)$ and sketch a proof that H is unambiguous.

Part a. Describe $L(G)$.

Let $A = \{a^n b^n \mid n \geq 1\}$, then $L(G) = \{w \mid w \in A^+\}$.

Part b. Show that G is ambiguous.

Then CFG G is ambiguous, because the string *ababab* is a member of $L(G)$ and it has more than 1 parse trees in G.



Two parse trees of the string *ababab*.

Part c. Give an unambiguous grammar H where $L(H) = L(G)$.

$$S \to ST \mid T$$
$$T \to aTb \mid ab$$

Part d. Sketch a proof that H is unambiguous.