

HW 7 CMSC 452. Morally DUE Oct 21

This HW is three pages- so don't miss any.

1. (0 points) What is your name? Write it clearly. Staple your HW. When is the midterm?
2. (25 points) Prove that the number of context free languages is countable.
3. (25 points) Let G be the following grammar:
 - Nonterminals are S, A, B, C, D , terminals are $\{a, b\}$, Start symbol is S .
 - Rules are
$$S \rightarrow ABC$$
$$S \rightarrow aAB$$
$$A \rightarrow BC$$
$$A \rightarrow e$$
$$B \rightarrow BD$$
$$B \rightarrow e$$
$$C \rightarrow ABS$$
$$C \rightarrow e$$
$$D \rightarrow S$$

Use the procedure shown in class (and its in the notes) to find (1) if $e \in L(G)$ and (2) to output an e -free grammar G' such that

$L(G') = L(G) - \{e\}$. When you use the procedure FIRST remove $A \rightarrow e$, THEN remove $B \rightarrow e$, THEN remove $C \rightarrow e$, then remove whatever else has to be removed.

4. (25 points) Let G be the following grammar:

- Nonterminals are S, A, B, C, D , terminals are $\{a, b\}$, Start symbol is S .
- Rules are
 - $S \rightarrow AB$
 - $S \rightarrow A$
 - $S \rightarrow SAS$
 - $A \rightarrow B$
 - $A \rightarrow BCa$
 - $A \rightarrow a$
 - $B \rightarrow C$
 - $B \rightarrow DCb$
 - $B \rightarrow BD$
 - $B \rightarrow b$
 - $C \rightarrow cAB$
 - $D \rightarrow S$

Use the procedure shown in class (and its in the notes) to both find a context free grammar G' that has no unit productions and such that $L(G) = L(G')$.

5. (25 points) Let G be the following grammar:

- Nonterminals are S, A, B, C, D , terminals are $\{a, b\}$, Start symbol is S .
- Rules are
$$S \rightarrow AB$$
$$S \rightarrow a$$
$$S \rightarrow SAS$$
$$A \rightarrow BD$$
$$A \rightarrow BCa$$
$$A \rightarrow a$$
$$B \rightarrow CB$$
$$B \rightarrow DCb$$
$$B \rightarrow BCD$$
$$B \rightarrow b$$
$$C \rightarrow cAB$$
$$D \rightarrow SS$$

Use the procedure shown in class (and its in the notes) to both find a context free grammar G' in Chomsky Normal Form such that $L(G) = L(G')$.