

474 HW 11 problems (highlighted problems are the ones to turn in)

11.12b Note that there are two things to show; use induction for both: (a) Every string in *Bal* can be derived from the grammar (easiest to show something more general by induction on the length of the string, and then use that to show this property); (b) every string that can be derived from the grammar is in *Bal* (easiest to show something more general by induction on the length of the derivation and then use that to show this property).

11.11  
(#1)

11. In I.3.1, we present a simplified grammar for URIs (Uniform Resource Identifiers), the names that we use to refer to objects on the Web.
- Using that grammar, show a parse tree for:  
`https://www.mystuff.wow/widgets/fradgit#sword`
  - Write a regular expression that is equivalent to the grammar that we present.

11.12b  
(#2) 6+6

12. Prove that each of the following grammars is correct:
- The grammar, shown in Example 11.3, for the language PalEven.
  - The grammar, shown in Example 11.1, for the language Bal.

11.13a  
(#3) 6+6

13. For each of the following grammars  $G$ , show that  $G$  is ambiguous. Then find an equivalent grammar that is not ambiguous.
- $(\{S, A, B, T, a, c\}, \{a, c\}, R, S)$ , where  $R = \{S \rightarrow AB, S \rightarrow BA, A \rightarrow aA, A \rightarrow ac, B \rightarrow Tc, T \rightarrow aT, T \rightarrow a\}$ .

11.14  
(#4) 6

14. Let  $G$  be any context-free grammar. Show that the number of strings that have a derivation in  $G$  of length  $n$  or less, for any  $n > 0$ , is finite.

11.15  
(#5)

15. Consider the fragment of a Java grammar that is presented in Example 11.20. How could it be changed to force each `else` clause to be attached to the outermost possible `if` statement?

problem:

11.17  
(#6) 6+3+6

17. Consider the grammar  $G'$  of Example 11.19.
- Convert  $G'$  to Chomsky normal form.
  - Consider the string `id*id+id`.
    - Show the parse tree that  $G'$  produces for it.
    - Show the parse tree that your Chomsky normal form grammar produces for it.

11.18  
(#7)

18. Convert each of the following grammars to Chomsky normal form:
- $S \rightarrow aSa$   
 $S \rightarrow B$   
 $B \rightarrow bbC$   
 $B \rightarrow bb$   
 $C \rightarrow \varepsilon$   
 $C \rightarrow cC$
  - $S \rightarrow ABC$   
 $A \rightarrow aC \mid D$   
 $B \rightarrow bB \mid \varepsilon \mid A$   
 $C \rightarrow Ac \mid \varepsilon \mid Cc$   
 $D \rightarrow aa$
  - $S \rightarrow aTVa$   
 $T \rightarrow aTa \mid bTb \mid \varepsilon \mid V$   
 $V \rightarrow cVc \mid \varepsilon$