



Zayd

- [Home Page](#)
- [Assignments Due](#)
- [Progress Report](#)
- [Handouts](#)
- [Tutorials](#)
- [Homeworks](#)
- [Lab Projects](#)
- [Log Out](#)

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Based on Sections 5.1 and 5.4 of HMU. Note: there are many other questions on these topics; this homework is a recommended set.

Help

1. The grammar G :

$$S \rightarrow SS \mid a \mid b$$

is ambiguous. That means at least some of the strings in its language have more than one leftmost derivation. However, it may be that some strings in the language have only one derivation. Identify from the list below a string that has exactly TWO leftmost derivations in G .

- a) bbb
- b) ab
- c) aa
- d) abbab

Answer submitted: a)

You have answered the question correctly.

2. Programming languages are often described using an extended form of context-free grammar, where square brackets are used to denote an optional construct. For example, $A \rightarrow B[C]D$ says that an A can be replaced by a B and a D , with an optional C between them. This notation does not allow us to describe anything but context-free languages, since an extended

production can always be replaced by several conventional productions.

Suppose a grammar has the extended productions:

$$A \rightarrow B[CDE]FGH \mid BCD[EFG]H$$

Convert this pair of extended productions to conventional productions. Identify, from the list below, the conventional productions that are equivalent to the extended productions above.

- a) $A \rightarrow BA_1H$
 $A_1 \rightarrow CDE \mid EFG$
- b) $A \rightarrow BCDEFGH \mid BFGH \mid BCDH$
- c) $A \rightarrow BCDEFGH \mid BH$
- d) $A \rightarrow BA_1H$
 $A_1 \rightarrow CDE \mid EFG \mid \epsilon$

Answer submitted: b)

You have answered the question correctly.

3. Consider the language $L = \{a^n\}$. Which grammar defines L ?

- a) $G_1: S \rightarrow AC|a, A \rightarrow c|b|\epsilon$
- b) $G_1: S \rightarrow d|a, A \rightarrow c|b|\epsilon$
- c) $G_1: S \rightarrow AB|a|b, A \rightarrow b$
- d) $G_1: S \rightarrow ac|a, A \rightarrow c|b|\epsilon$

Answer submitted: **a)**

You have answered the question correctly.

4. Consider the grammars:

$G_1: S \rightarrow SaS \mid aa \mid a$

$G_2: S \rightarrow SS \mid \epsilon$

$G_3: S \rightarrow SS \mid a$

$G_4: S \rightarrow SS \mid aa$

$G_5: S \rightarrow Sa \mid a$

$G_6: S \rightarrow aSa \mid aa \mid a$

$G_7: S \rightarrow SAS \mid \epsilon$

Describe the language of each of these grammars. Then, identify from the list below a pair of grammars that define the same language.

- a) G_5, G_4
- b) G_3, G_2
- c) G_5, G_6
- d) G_1, G_4

Answer submitted: **c)**

You have answered the question correctly.

5. Here is a context-free grammar G:

$S \rightarrow AB$

$A \rightarrow 0A1 \mid 2$

$B \rightarrow 1B \mid 3A$

Which of the following strings is in $L(G)$?

- a) 002111300211
- b) 000211111321
- c) 00211100211
- d) 000021130011

Answer submitted: **a)**

You have answered the question correctly.