

Automata Theory: Solutions 7

				X				
				X			X	
number of				X			X	
homeworks				X	X	X		X
				X	X	X		X
	X	X	X	X	X	X		X
	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X

	3	4	5	6	7	8	9	10
	grades							

Problem 1

Give a context-free grammar for each of the following languages:

- (a) $\{a^n b^{2n} : n \geq 0\}$
- (b) $\{a^n b^m c^{n+m} : n, m \geq 0\}$
- (c) $\{a^n b^m c^k : n + k \leq m \leq 2n + 2k\}$

(a) $S \rightarrow aSbb \mid \lambda$

(b) $S \rightarrow aSc \mid A$
 $A \rightarrow bAc \mid \lambda$

(c) $S \rightarrow AB$
 $A \rightarrow aAb \mid aAbb \mid \lambda$
 $B \rightarrow bBc \mid bbBc \mid \lambda$

Problem 2

Consider the following grammar:

$$S \rightarrow SA \mid A$$

$$A \rightarrow aAb \mid \lambda$$

Show a leftmost derivation, rightmost derivation, and derivation tree for $abaabb$.

Leftmost derivation:

$$S \Rightarrow SA \Rightarrow AA \Rightarrow aAbA \Rightarrow abA \Rightarrow abaAb \Rightarrow abaaAbb \Rightarrow abaabb$$

Rightmost derivation:

$$S \Rightarrow SA \Rightarrow SaAb \Rightarrow SaaAbb \Rightarrow Saabb \Rightarrow Aaabb \Rightarrow aAbaabb \Rightarrow abaabb$$

Derivation tree:

