

Assignment #4

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Question 1.

Question 2.

Question 3.

(a) $G = (V, \Sigma, R, S)$ where:

- $V = \{S\}$
- $\Sigma = \{a, b\}$
- Note that $\epsilon \in L_1$, therefore our first rule is $S \rightarrow \epsilon$. To build other strings we have to add 1's into the end and twice this number of 0's at the beginning of the string, then the second rule is $S \rightarrow 00S1$.
 $R = \{S \rightarrow \epsilon, S \rightarrow 00S1\}$

(b) $G = (V, \Sigma, R, S)$ where:

- $V = \{S\}$
- $\Sigma = \{a, b\}$
- Note that $\epsilon \in L_1$, therefore our first rule is $S \rightarrow \epsilon$. To build other strings of this language we have to guarantee that $m \geq n$ and keep m and n both odd or even. To do that we need two more rules:

$$1 \ S \rightarrow aSb$$

$$1 \ S \rightarrow Sbb$$

Since these two rules keep $m \geq n$ and $m - n$ even, we have that $R = \{S \rightarrow \epsilon, S \rightarrow Sbb, S \rightarrow aSb\}$.

Question 4.