Name ___Solutions____ Discrete II, Quiz 4

Consider the grammar (N, T, P, σ) given as defined below.

$N = \{<s>\}$

$T = \{A, B, C, \ldots, Z, \wedge, \vee, !\}$

$$P = \begin{Bmatrix} <s> \to <s> \wedge <s> \\ <s> \to <s> \vee <s> \\ <s> \to\ !<s> \\ <s> \to A|B|C|\cdots|Y|Z \end{Bmatrix}$$

$\sigma = <s>$

1a) How many valid words are in the language this grammar defines?

Infinitely many. For instance it contains:

$$\begin{gathered} A \\ A \wedge A \\ A \wedge A \wedge A \\ A \wedge A \wedge A \wedge A \\ \vdots \end{gathered}$$

1b) Show that "$A \wedge B \vee !C$" is in this language by providing a derivation.

$$\begin{aligned} <s> &\Rightarrow <s> \wedge <s> \\ &\Rightarrow <s> \wedge <s> \vee <s> \\ &\Rightarrow <s> \wedge <s> \vee !<s> \\ &\Rightarrow A \wedge <s> \vee !<s> \\ &\Rightarrow A \wedge B \vee !<s> \\ &\Rightarrow A \wedge B \vee !C \end{aligned}$$

2) Write a grammar that generates the strings over $\{a, b, c\}$ that end in $abcba$.

A grammar is (N, T, P, σ) where:

$N = \{x, y\}$

$T = \{a, b, c\}$

$$P = \begin{Bmatrix} y \to xabcba \\ x \to a|b|c|``" \\ x \to xa|xb|xc \end{Bmatrix}$$

$\sigma = y$

There are many correct answers.

If I wrote a derivation on your paper, it means your grammar has a valid word not ending in $abcba$.

If I wrote a string with a question mark, it means your grammar is missing that word.