

Theory of Computation

Grammar

Lecture 18

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Grammar

1) Unrestricted grammar $\rightarrow (VUT)^+ \rightarrow (VUT)^* \}$ T.M

2) CSG $\left. \begin{matrix} \text{ } \end{matrix} \right\}^+ X \rightarrow Y, \text{ where } |X| \leq |Y| \}$ LBA

3) CFG $\left. \begin{matrix} \text{ } \end{matrix} \right\}^+ X \rightarrow Y, X \in V \}$ PDA

4) Regular Grammar $\left. \begin{matrix} \text{ } \end{matrix} \right\}^+$

$\left. \begin{matrix} \boxed{\cdot} \\ \boxed{\cdot} \end{matrix} \right\} \begin{matrix} \text{LLG} \\ \text{RLG} \end{matrix}$

$\bigcirc V \rightarrow \underline{VT^*} \bigcirc \text{OR} \underline{T^*V} \text{ OR } \underline{T^*} \}$ F.A

$$1. \ S \rightarrow \epsilon \quad L = \{\epsilon\}$$

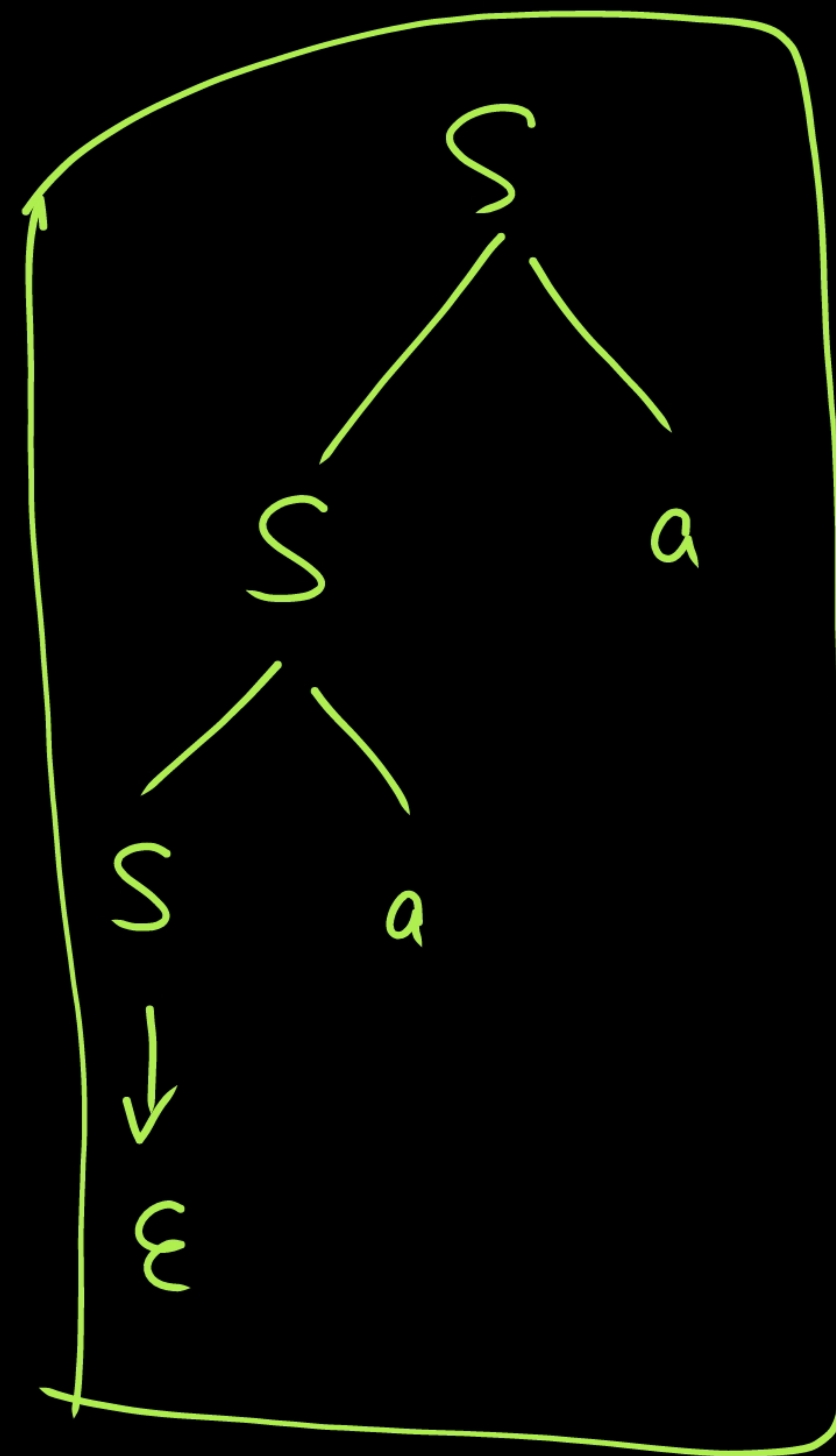
$$2. \ S \rightarrow a \quad L = \{a\}$$

$$3. \ S \rightarrow ab \quad L = \{ab\}$$

$$4. \ S \rightarrow a | ab | \epsilon \quad L = \{\epsilon, a, ab\}$$

$$5. \ S \rightarrow Sa | \epsilon \quad L = a^*$$

\swarrow
 Sa^*



$V \rightarrow$ ^{Set of} variables

$S \rightarrow$ Starting variable

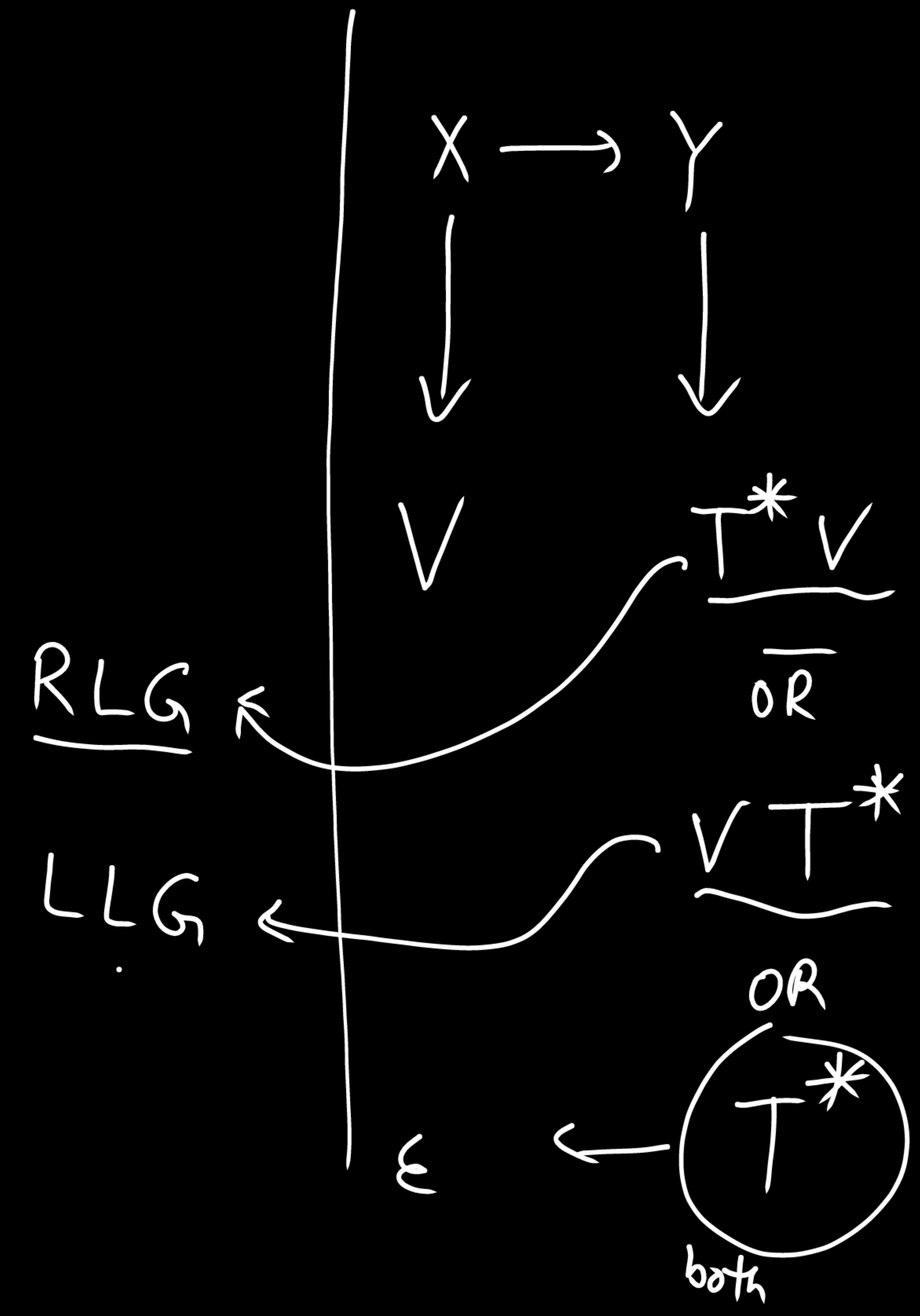
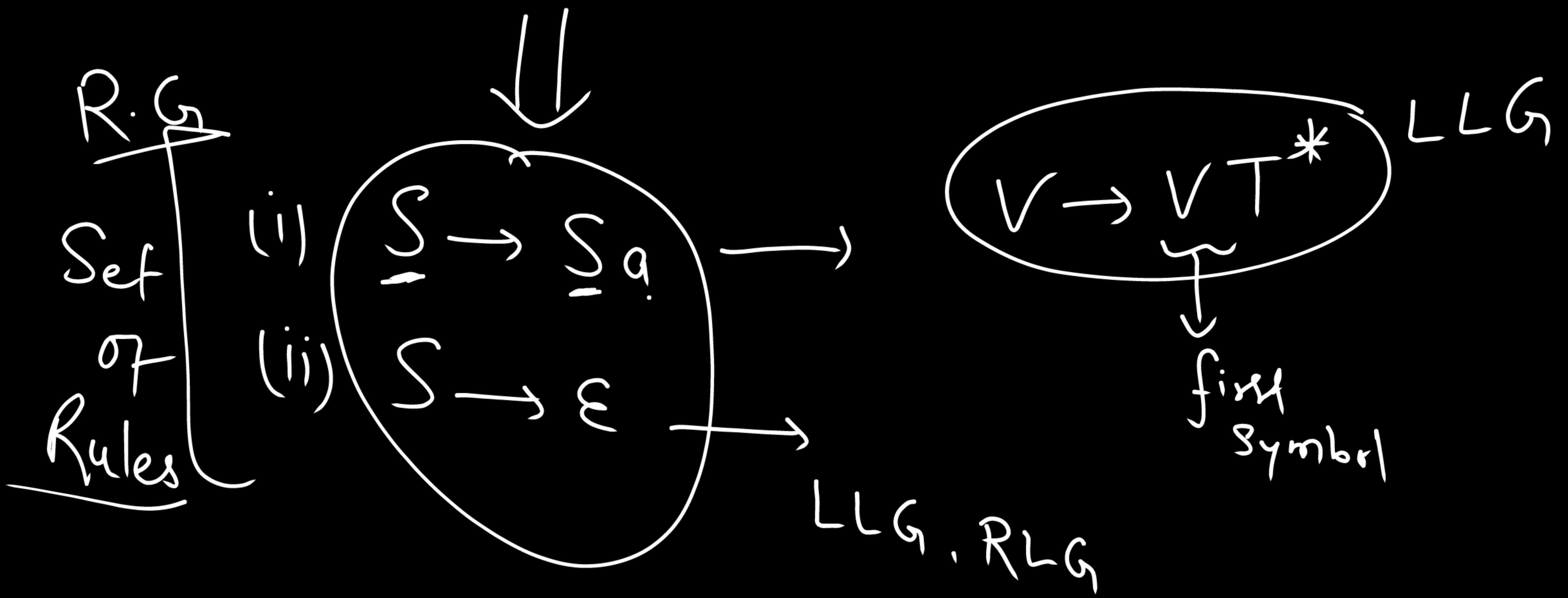
$T \rightarrow$ Set of terminals

$V \rightarrow \{S\}$

$T \rightarrow \{a\}$

R.G 1.7 $S \rightarrow \epsilon$.

2.7 $S \rightarrow Sa \mid \epsilon$



R.G 4.} $S \rightarrow aS / bS / c$

$S \rightarrow aS$ \rightarrow
 $S \rightarrow bS$ \rightarrow RLG
 $S \rightarrow c$ \rightarrow

~~R.G~~ 5.}

$S \rightarrow aS / cS / Sd / \epsilon$

$S \rightarrow aS$ \rightarrow RLG
 $S \rightarrow cS$ \rightarrow RLG
 $S \rightarrow Sd$ \rightarrow RLG
 $S \rightarrow \epsilon$ \rightarrow LLG OR ~~RLG~~
 \rightarrow LLG OR RLG

$\neg A \wedge \neg B$
 $\neg(A \cup B)$

R.G
6.

$S \rightarrow Aa$ \rightarrow LLG

$A \rightarrow b \rightarrow$ both

$S \rightarrow ba$

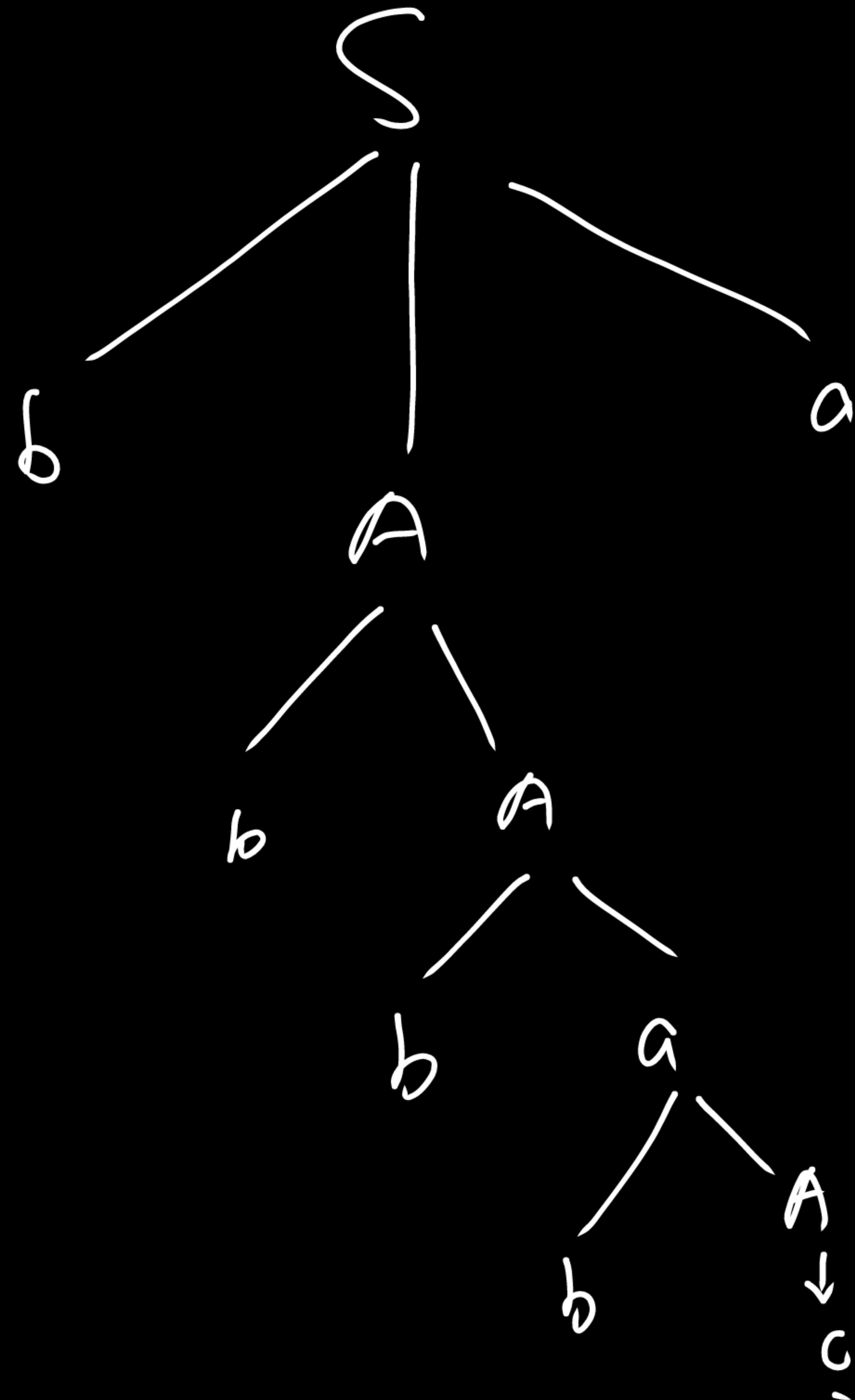
$L = \{ba\}$

T^*

7. $S \rightarrow Aa$ ①
 $A \rightarrow bA$ ② $| c$ ③

$S \rightarrow bAa$ $\{T^*\}$

$b^* \underline{c} \underline{a}$
 $\times b^+ \underline{c} \underline{a}$



$$7.] S \rightarrow AB$$

$$A \rightarrow \epsilon$$

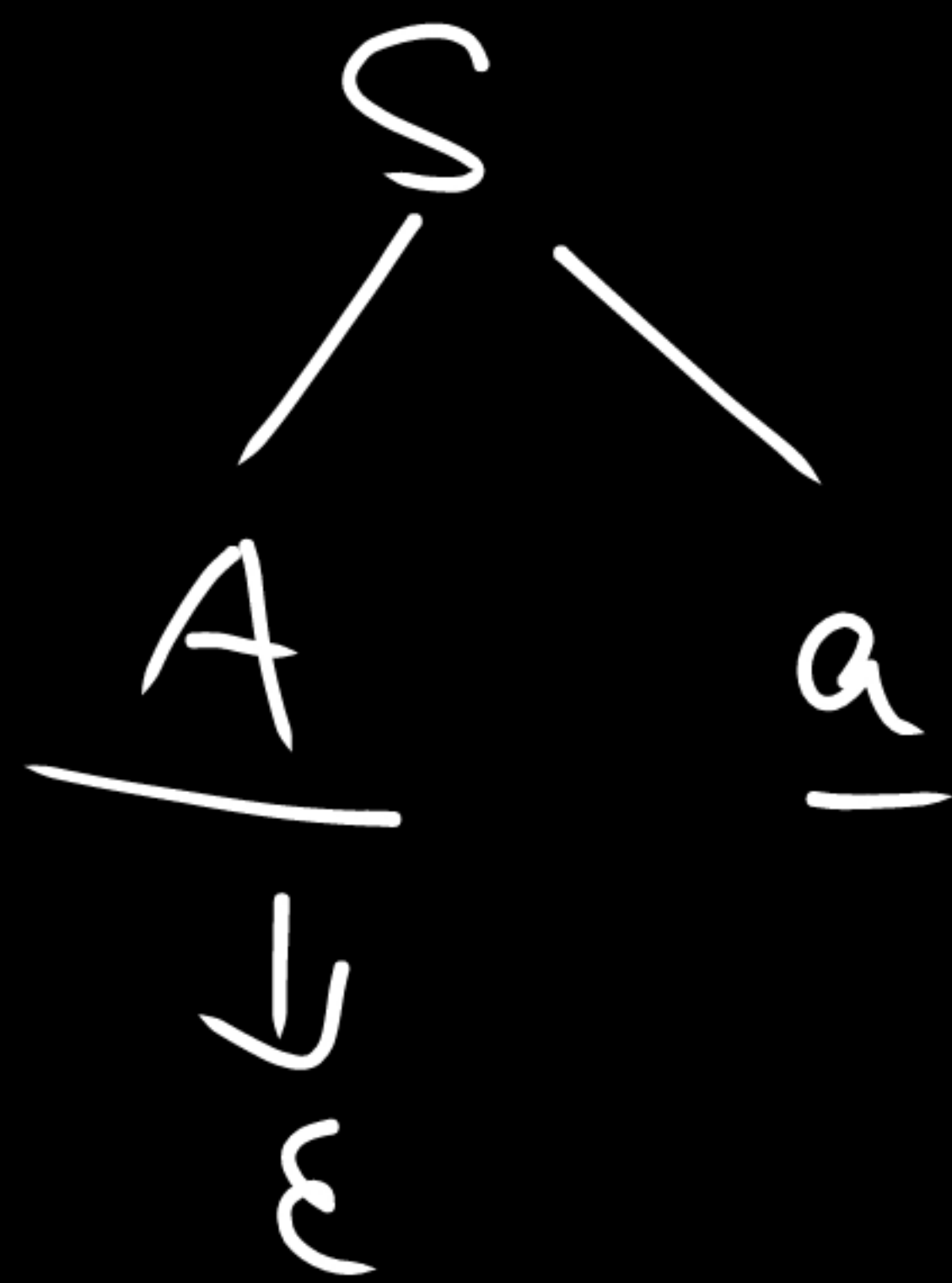
$$L = \{\epsilon\}$$

$$B \rightarrow \epsilon$$

$$R.G. 8.] \left. \begin{array}{l} S \rightarrow \overset{\textcircled{1}}{A} \underline{a} \\ A \rightarrow \underset{\substack{2 \\ a}}{a} \mid \underset{\substack{3 \\ \epsilon}}{\epsilon} \end{array} \right\}$$

$$L = \cancel{a^*} \quad \cancel{a^*}$$

$$L = \{a, aa\}$$



R.G

9

$$S \rightarrow \overset{\text{both}}{\overset{\textcircled{1}}{A}} a \mid \overset{\text{both}}{\overset{\textcircled{2}}{B}} b$$

$$A \rightarrow \epsilon \quad \text{both}$$

$$B \rightarrow \epsilon \quad \text{both}$$

$$L = \{a, b\}$$

$$L = (a+b)^*$$

$$R.G = ?$$

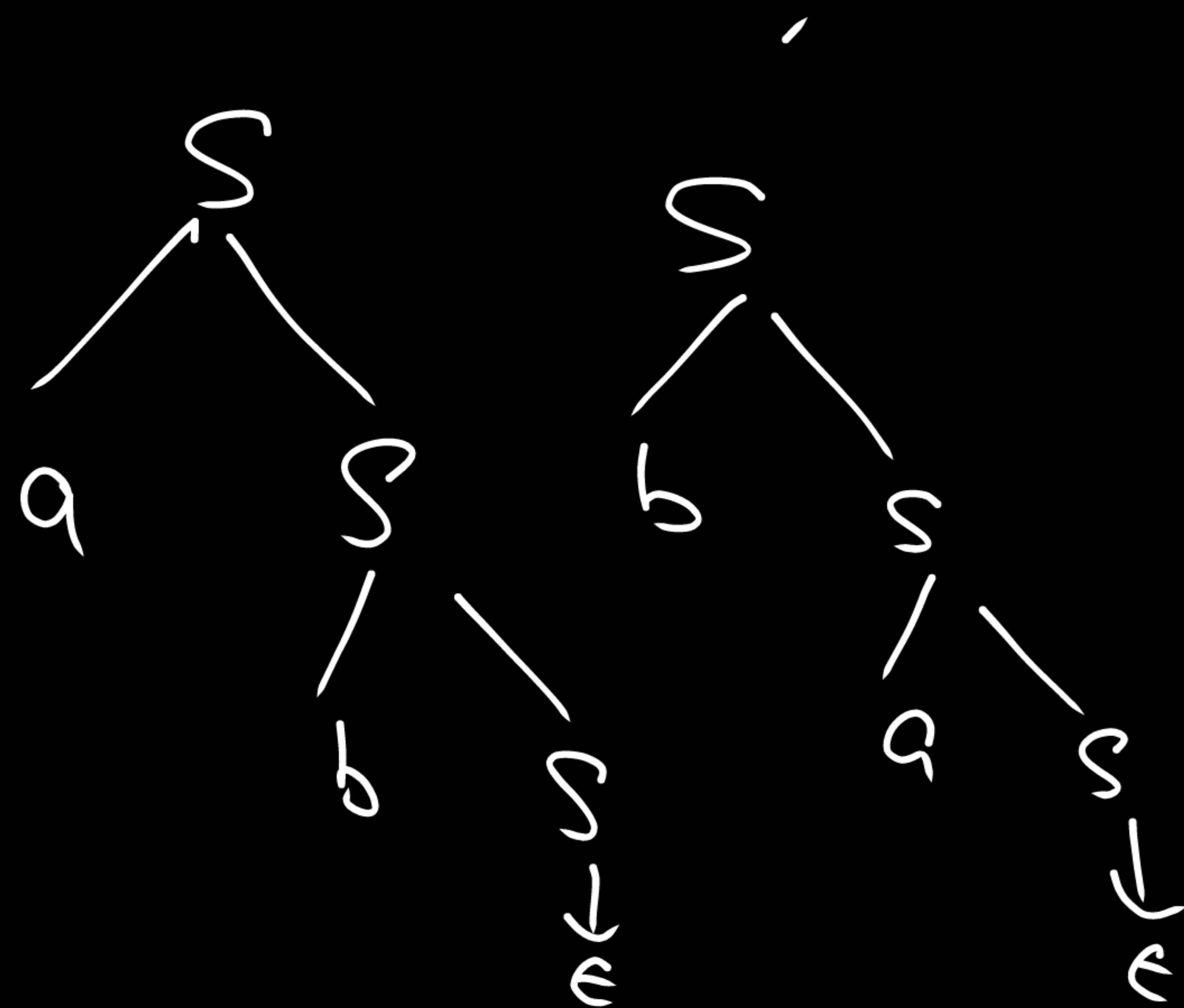
$$S \rightarrow \overset{\textcircled{1}}{a} \overset{\textcircled{1}}{A} \mid \overset{\textcircled{2}}{b} \overset{\textcircled{2}}{B}$$

$$A \rightarrow aA \mid \epsilon$$

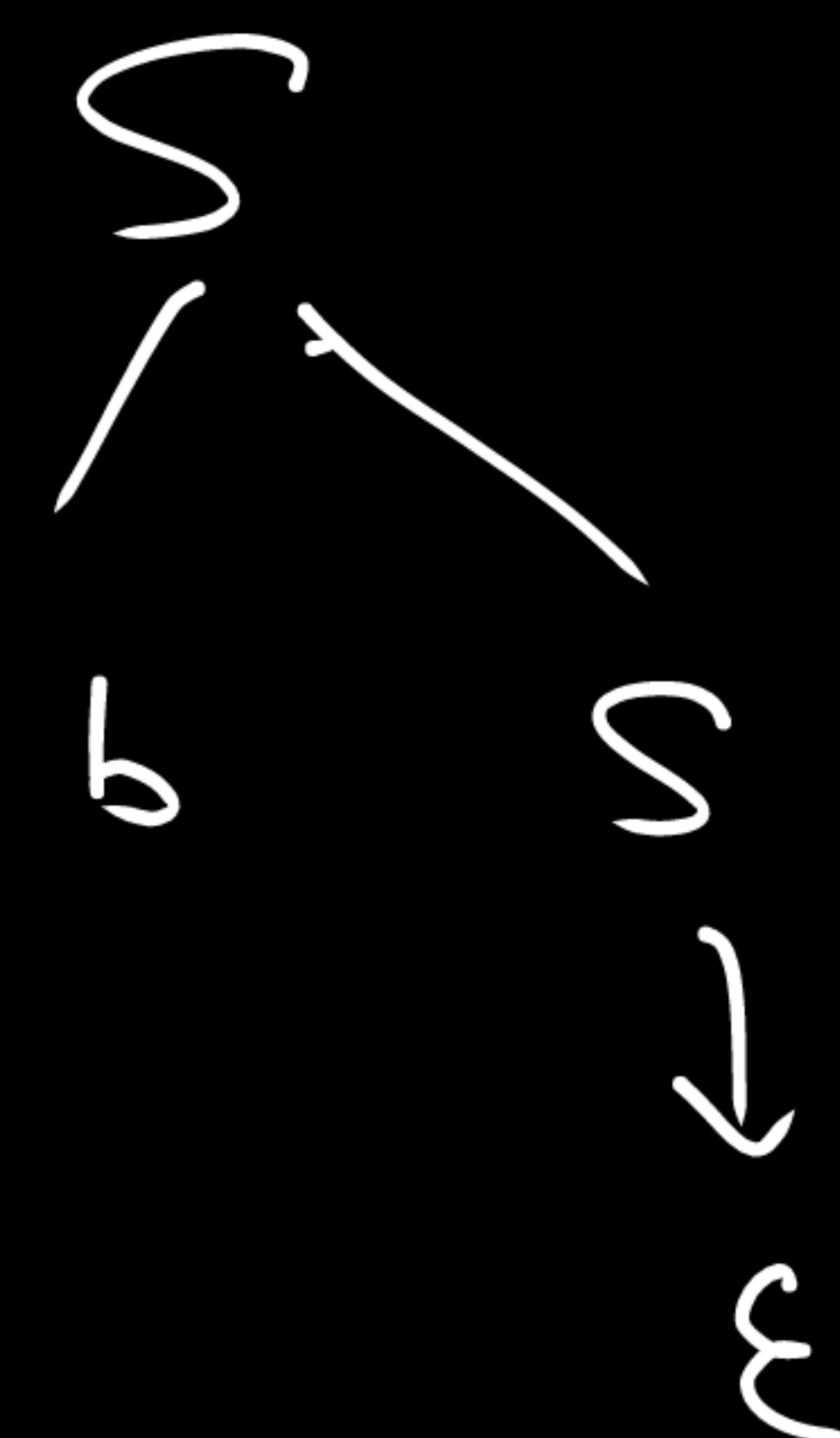
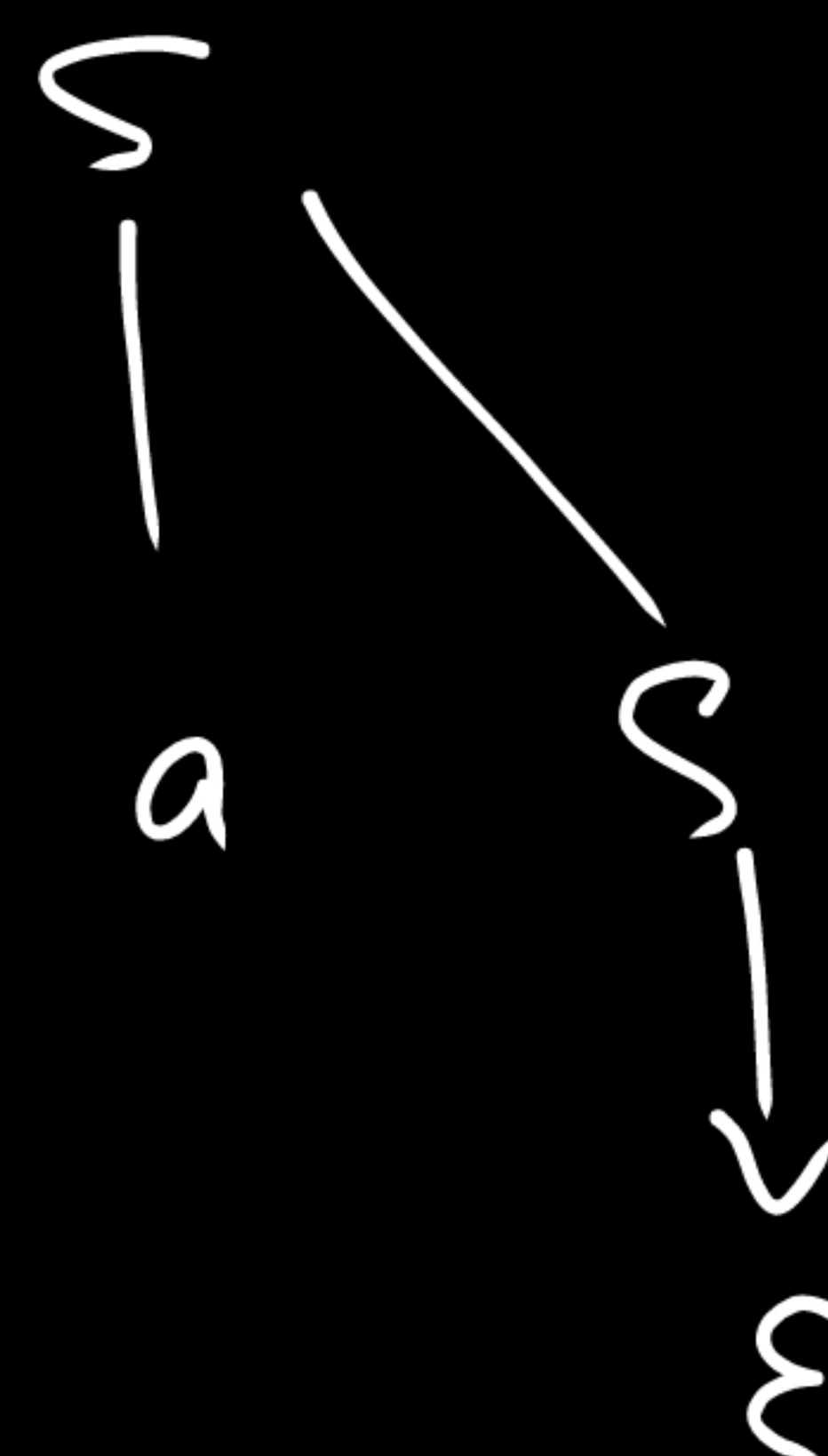
$$B \rightarrow bB \mid \epsilon$$

$$\frac{S \rightarrow aS / Sb / \epsilon}{X}$$

$$S \rightarrow aS / bS / \epsilon$$



$$S \rightarrow \epsilon$$





Thank You

