CFL

REGULAR

- compiladors
- formats documents (XML)

DFA

CFG

Noam Chomsky

$$G = (V, \Sigma, \delta, S)$$

$$\downarrow$$

$$\xrightarrow[G]{}$$

$$\underset{G}{\Rightarrow} \quad \Rightarrow \quad \overset{*}{\Rightarrow}$$

$$L(G) = \left\{ w \mid w \in \Sigma^*, \quad S \underset{G}{\overset{*}{\Rightarrow}} w \right\}$$

CFG ambigües

↓

redissenyar [*]

CFG'

↓ (left branch)   ↘ (right branch)

sí
no ambigua

CFL
inherentment
ambigus

$$\{ a^i b^j c^k \mid i = j \ or \ j = k \}$$
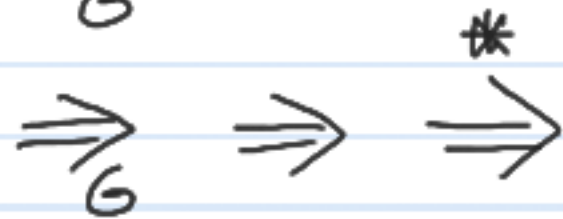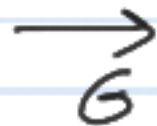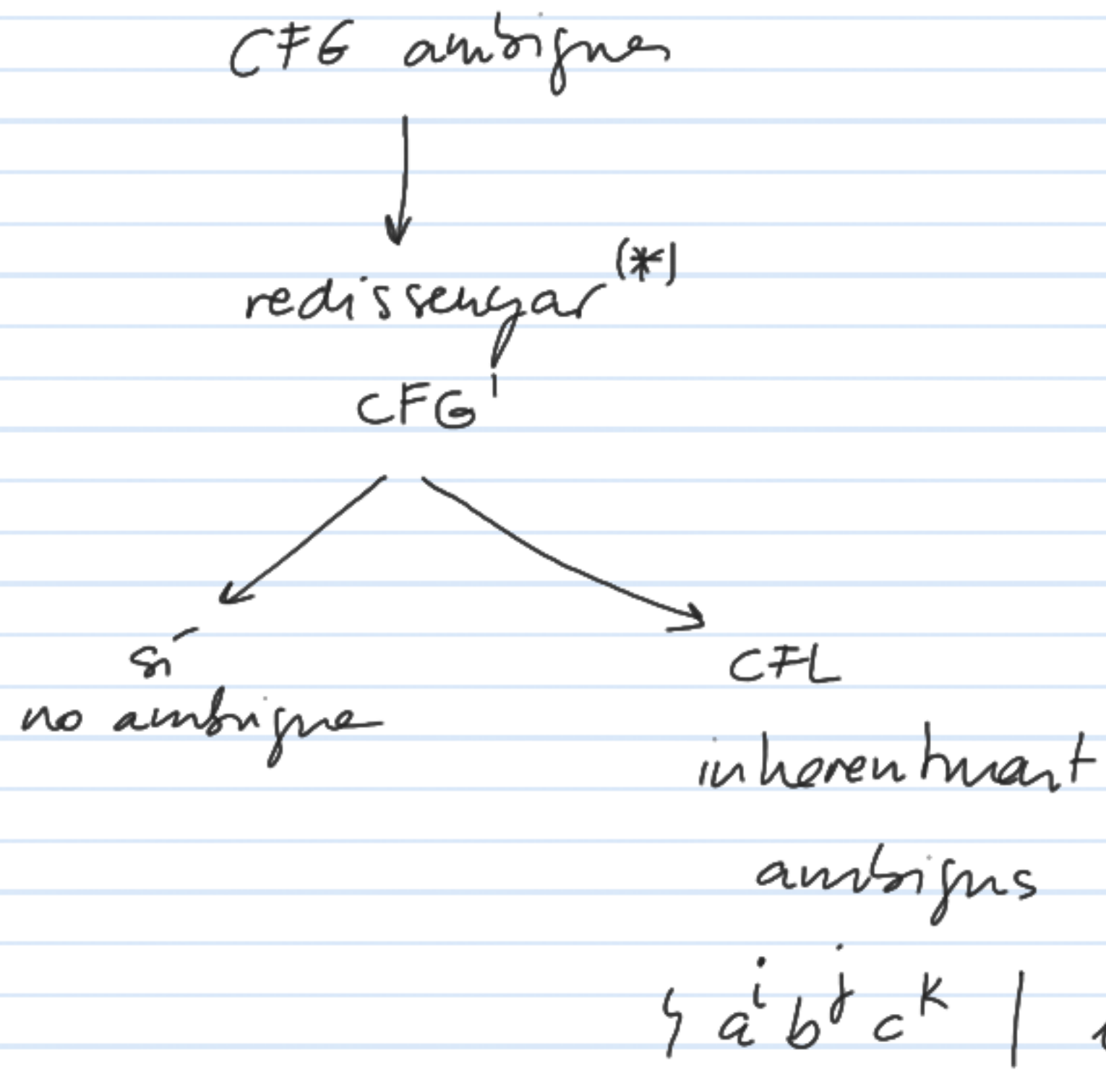
[*] No hi ha algorisme concret

$$E \longrightarrow E+E \mid E-E \mid N$$
$$N \longrightarrow ND \mid D$$
$$D \longrightarrow 0 \mid 1 \mid 2 \mid \cdots \cdots \mid 8 \mid 9$$

$\longrightarrow$ ambigua

$$E \longrightarrow N+E \mid N-E \mid N$$
$$N \longrightarrow ND \mid D$$
$$D \longrightarrow 0 \mid 1 \mid 2 \mid \cdots \cdots \mid 8 \mid 9$$

$\longrightarrow$ No ambigua

$$\underbrace{\cdots \cdots \cdots}_{E} + \underbrace{\cdots \cdots \cdots}_{E}$$

$$\overbrace{\underbrace{2.37}_{N}}^{\downarrow} + \underbrace{\cdots - - - - \cdots}_{E}$$

Es necessita ... CREATIVITAT i PRÀCTICA !!

Idees...

① CFG com a operacions de CFG's més petites
    (unions, rev, concat, *)

ex:

$S_1 \to \ldots$ $S_2 \to \ldots$ $S_3 \to \ldots$

$L(S_1 \cup S_2 \cup S_3) = L(S)$ on | $S \to S_1$ | S_2 | S_3 |

| $S_1 \to$
| ⋮
| $S_2 \to$
| ⋮
| $S_3 \to$
| ⋮

(mireu vídeo #15)

(2) si L regular

$$DFA \longrightarrow CFG$$

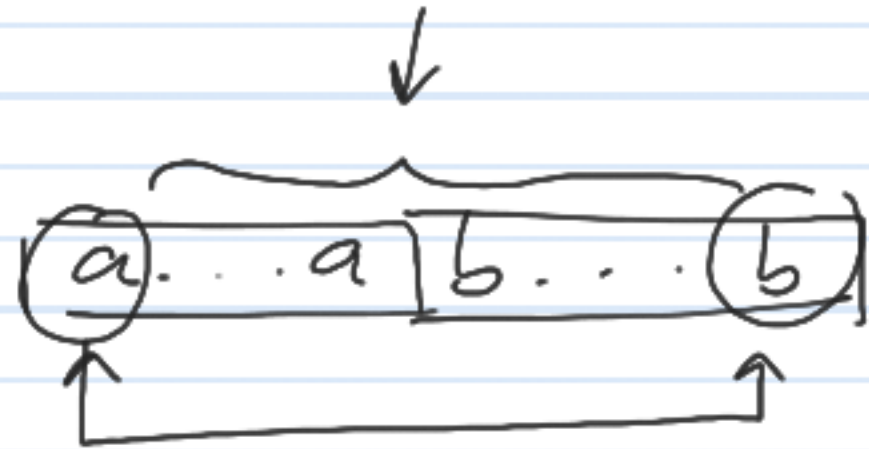$$q_i \longrightarrow \text{variable } R_i$$

$$\delta(q_i, a) = q_j \longrightarrow R_i \longrightarrow a R_j$$

$$q_i \text{ aceptador} \longrightarrow R_i \longrightarrow \lambda$$

$$q_0 \longrightarrow R_0 \text{ variable inicial}$$

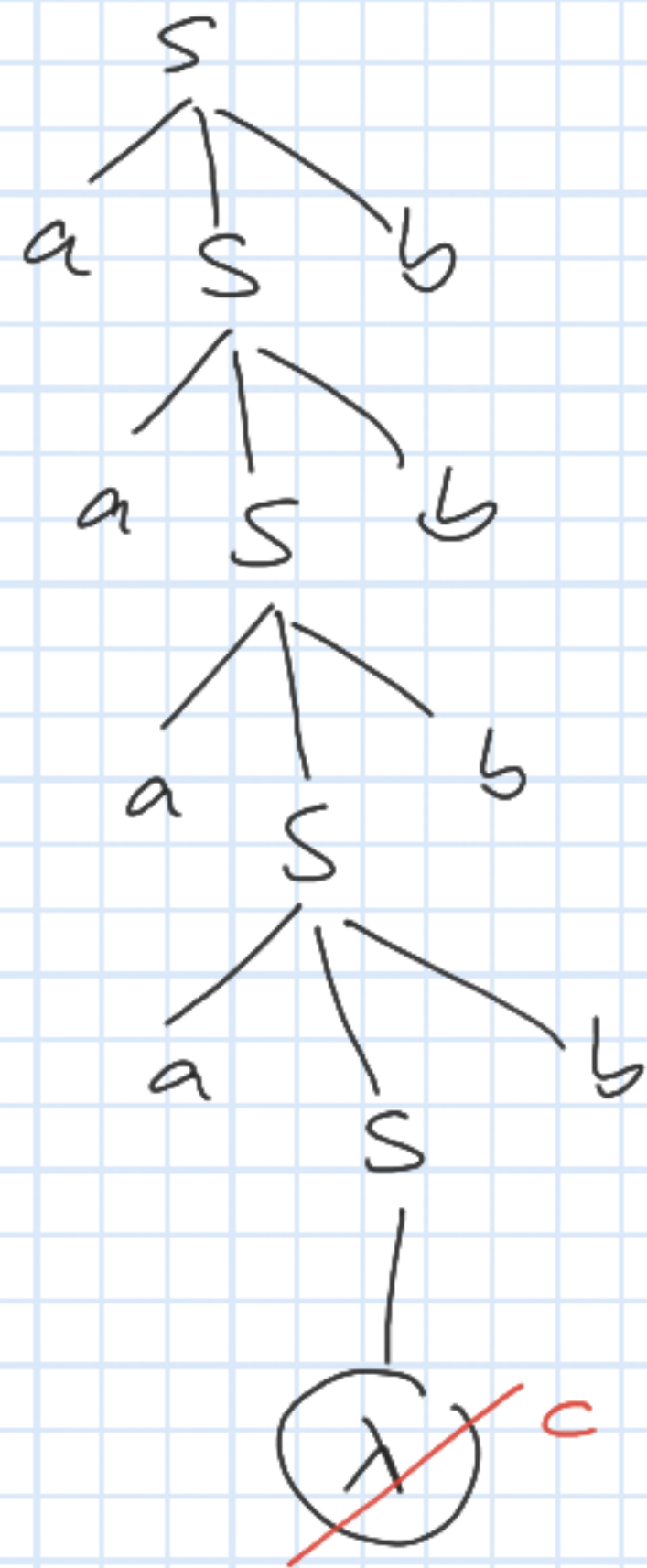(3) $\{ \underline{a}^n \underline{b}^n \mid n \geq 0 \}$
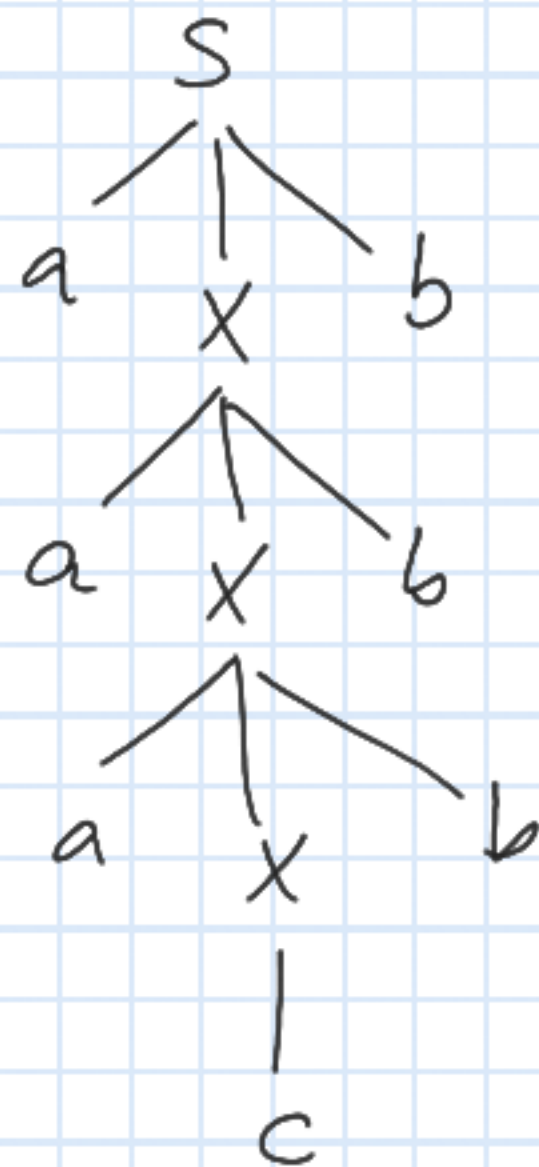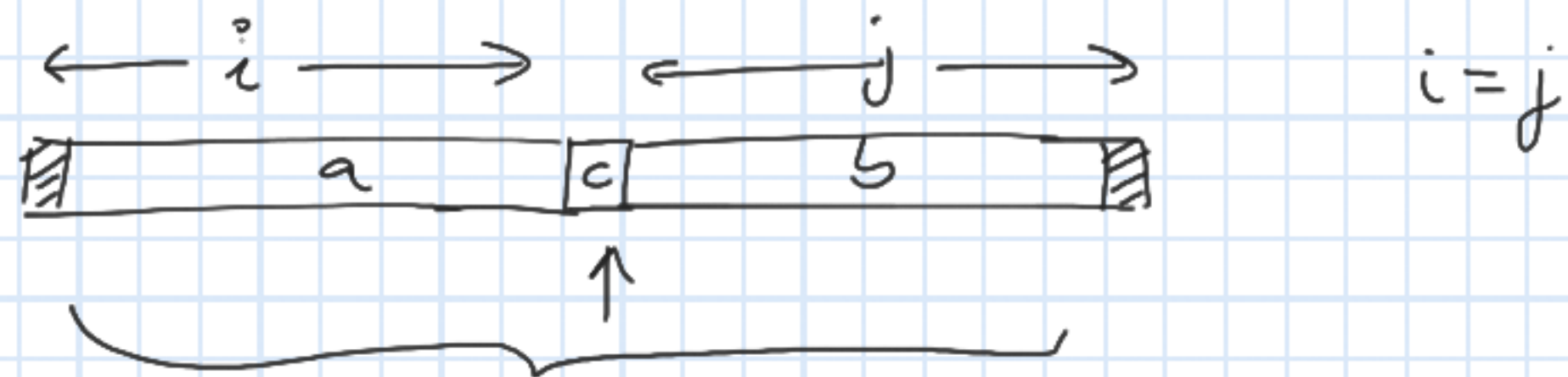

$$R \rightarrow a R b$$

(4) Detectar construcciones recursivas

variables

S
a   S   b
  a   S   b
    a   S   b
      a   S   b
        a   S   b
          S
          (λ) ⁄ c

$i = j$

Ex. 3

$i \geq j$

$S \longrightarrow aSb \mid aS \mid \lambda$

ambigüe

Tree 1:
```
        S
      / | \
     a  S  b
        |
      /   \
     a     S
           |
           λ
```

Tree 2:
```
        S
      /   \
     a     S
          /|\
         a S b
           |
           λ
```
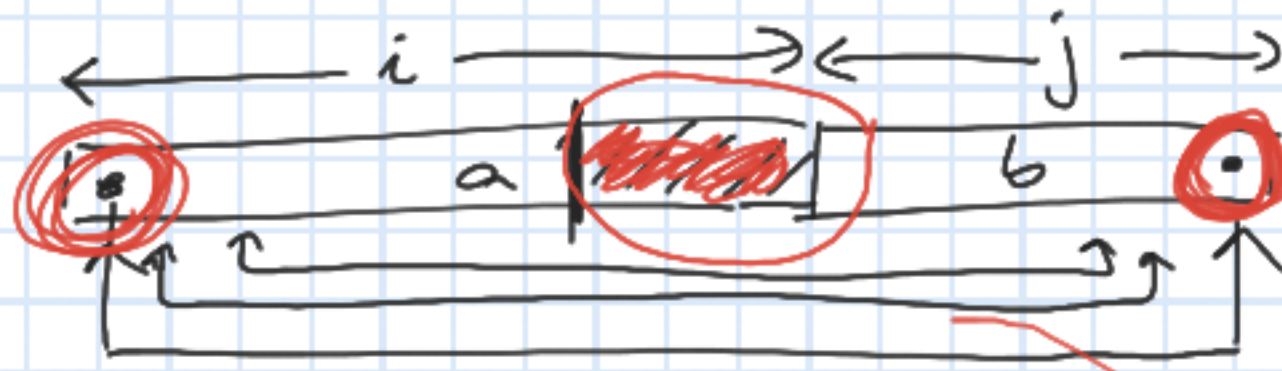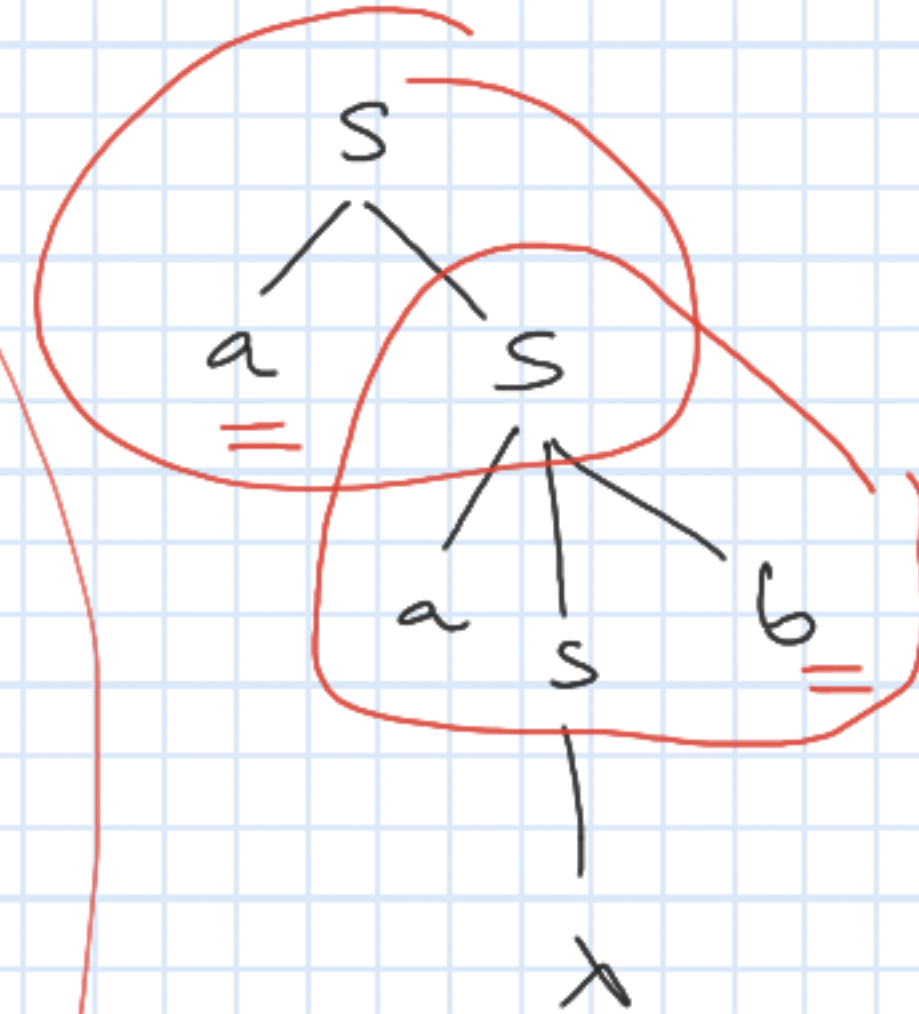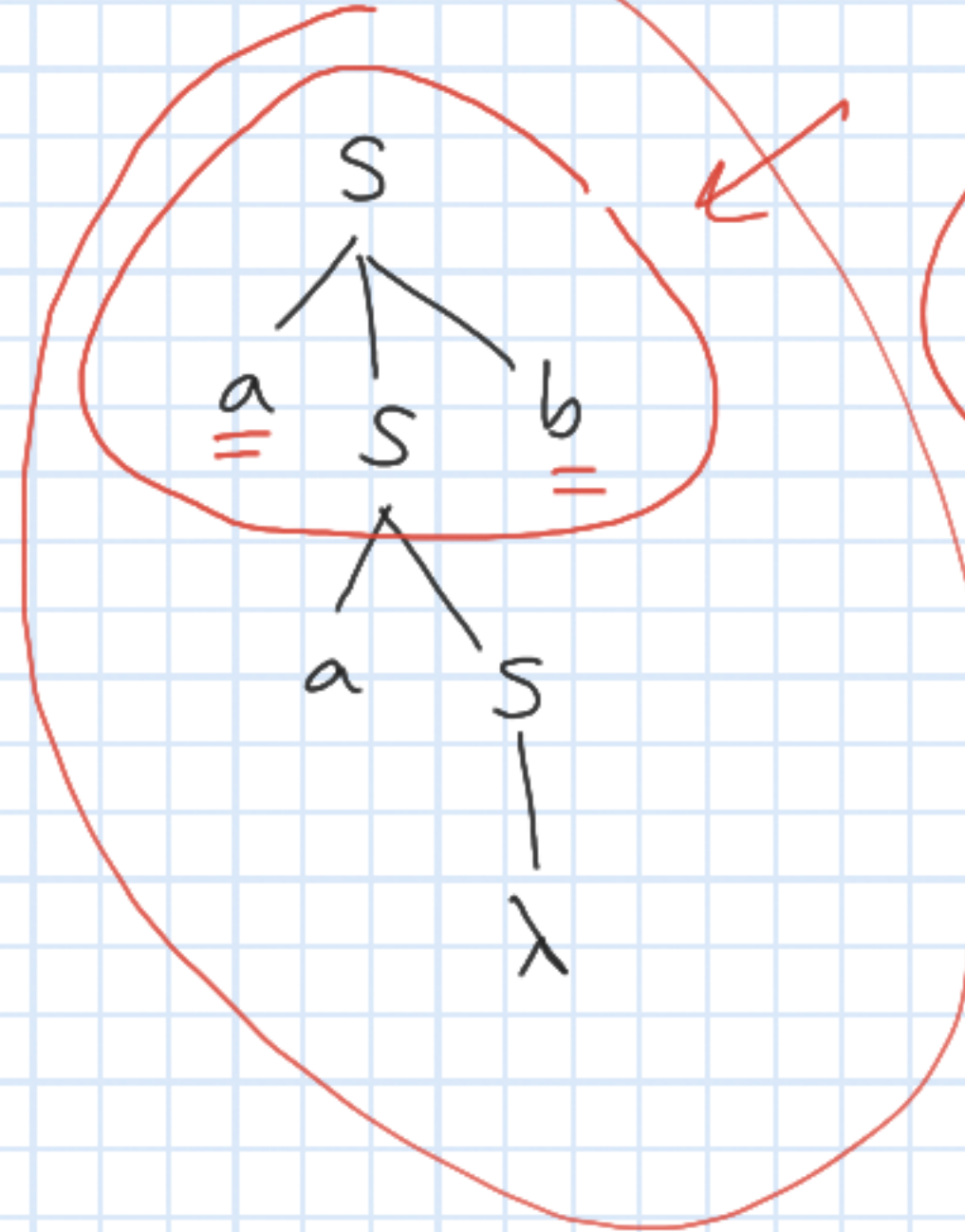
Ex. 10
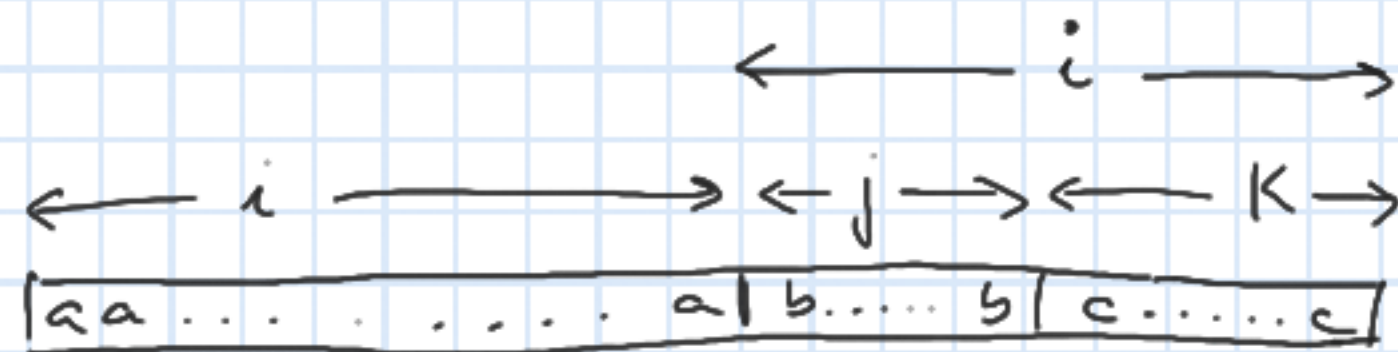
$$\{a^i b^j c^k \mid i = j + k\}$$

$$\parallel$$

$$\{a^k a^j b^j c^k \mid k, j \geq 0\}$$

Ex. 11

$$\xleftarrow{\quad i \quad}\xrightarrow{} \xleftarrow{\quad j = i+K \quad}\xrightarrow{} \xleftarrow{K}\xrightarrow{}$$

$$\xleftarrow{\quad i \quad}\xrightarrow{} | \xleftarrow{K}\xrightarrow{}$$
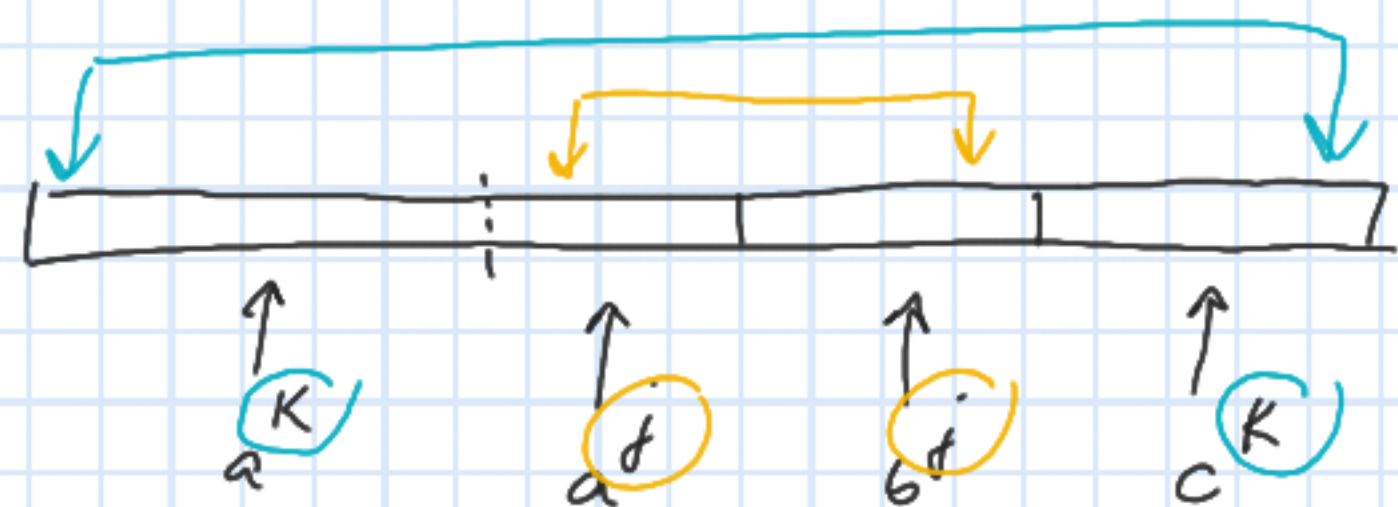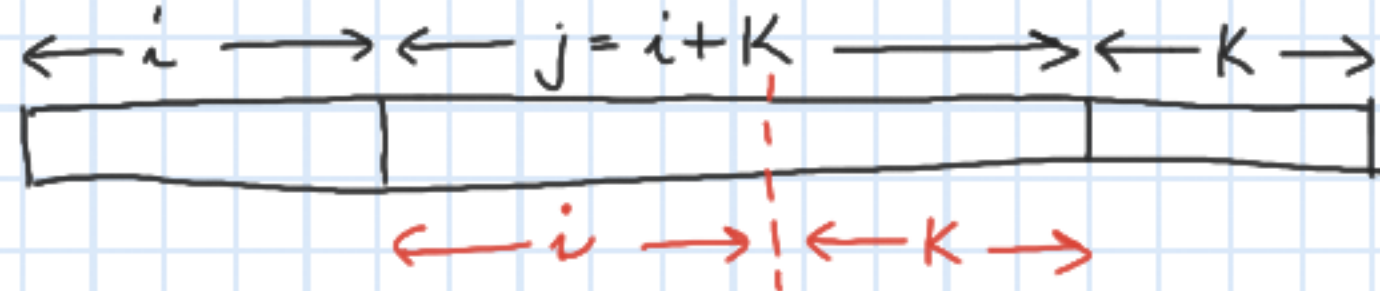
$$j = i + K$$

$$\{ a^i b^j c^K \mid j = i+K \} = \{ a^i b^i \; b^K c^K \mid i, K \geqslant 0 \}$$

$$= \{ a^i b^i \mid i \geqslant 0 \} \cdot \{ b^K c^K \mid K \geqslant 0 \}$$

$$\underbrace{\qquad\qquad}_{} \qquad\qquad \underbrace{\qquad\qquad}_{}$$

$$S \rightarrow a S b \mid \lambda \qquad\qquad S \rightarrow b S c \mid \lambda$$

$$X \qquad\qquad\qquad\qquad Y$$

$$\boxed{S \longrightarrow XY}$$

$$X \longrightarrow a X b \mid \lambda$$

$$Y \longrightarrow b Y c \mid \lambda$$