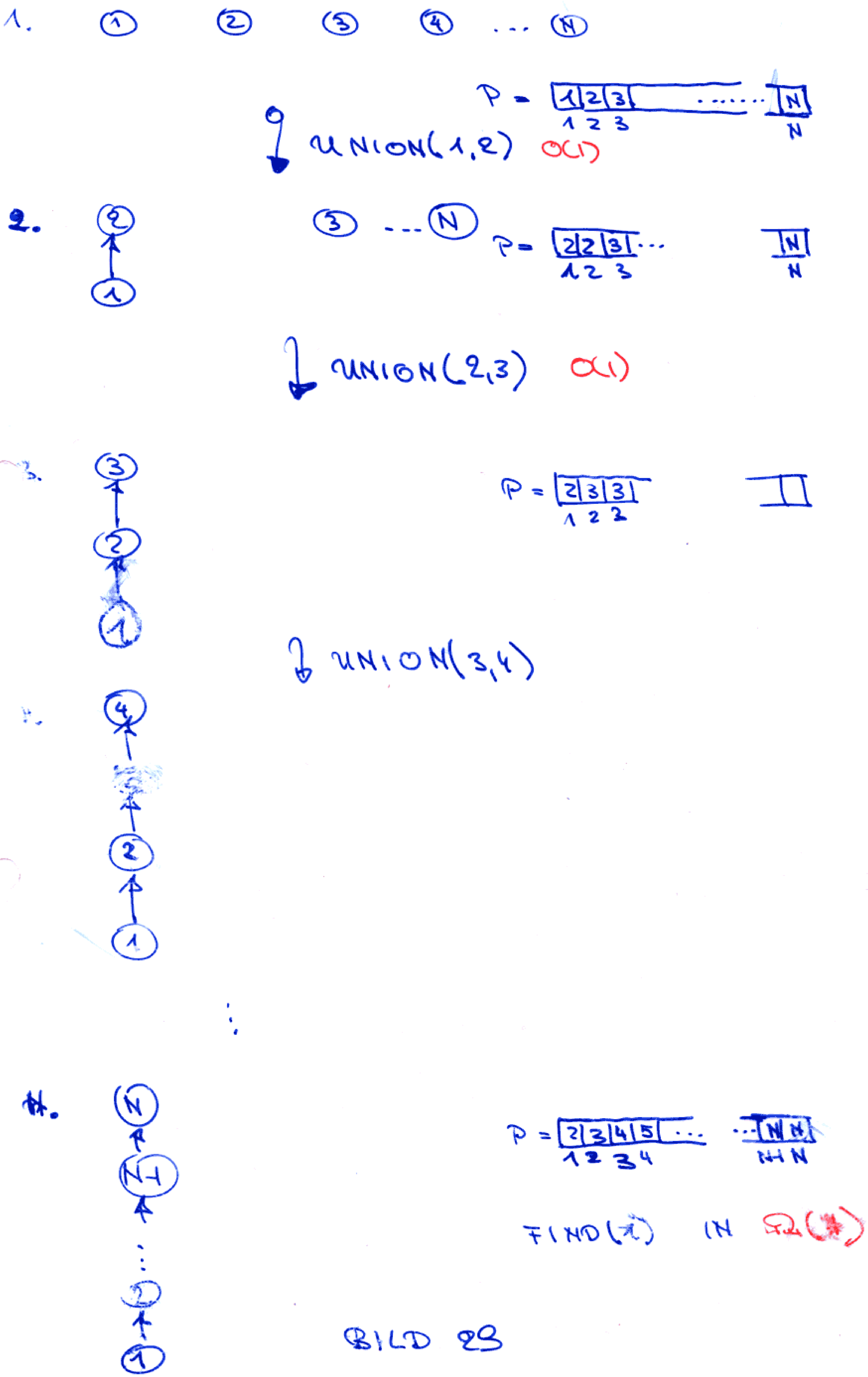
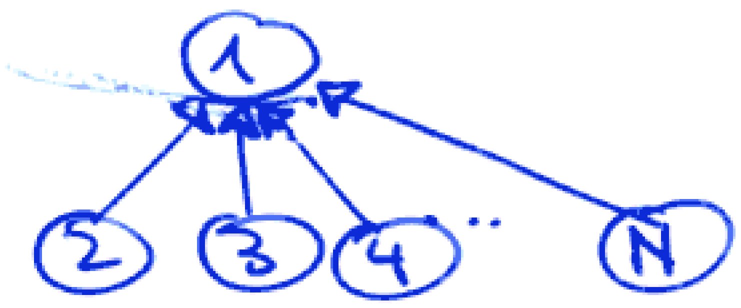


1.
1 2 3 4 ... N
P = 1 2 3 ... N
UNION(1,2) O(1)
2.
P = 2 2 3 ... N
UNION(2,3) O(1)
3.
P = 2 3 3
UNION(3,4)
N.
P = 2 3 4 5 ... N N
FIND(x) IN O(N)

BILD 23

1 2 3 4 ... N-1 N

UNION(2,1); UNION(3,1); UNION(4,1); ..., UNION(N,1)



VERTAUSCHEN DER ARGUMENTE.

FIND(i) IN $O(1)$.

$\Rightarrow$ UNION BY SIZE: KLEINERE ANZAHL NACH UNTEN.

BILD 24

UNION BY SIZE:

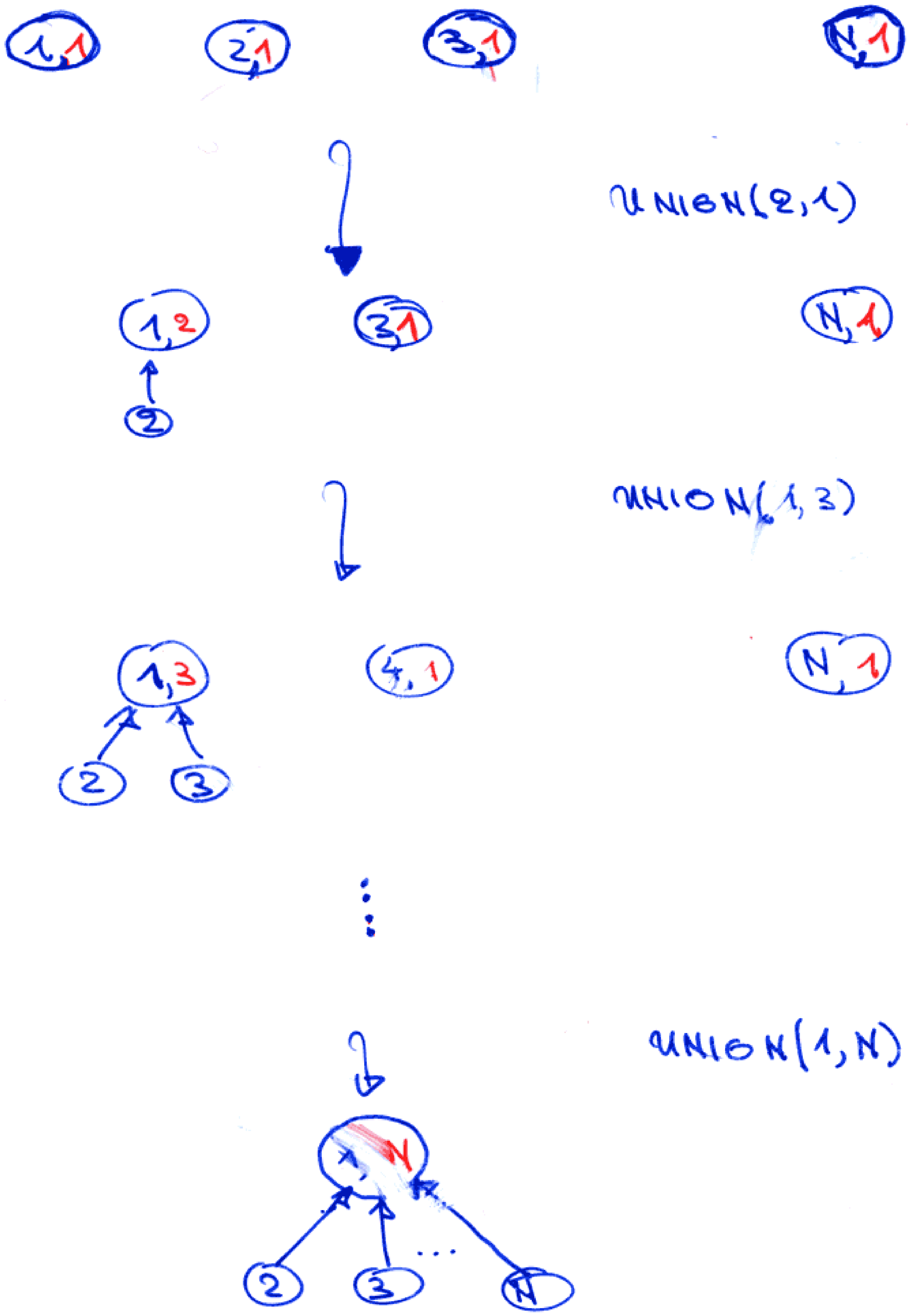


BILD 25

TIEFE BÄUME DURCH UNION-BY-SIZE?

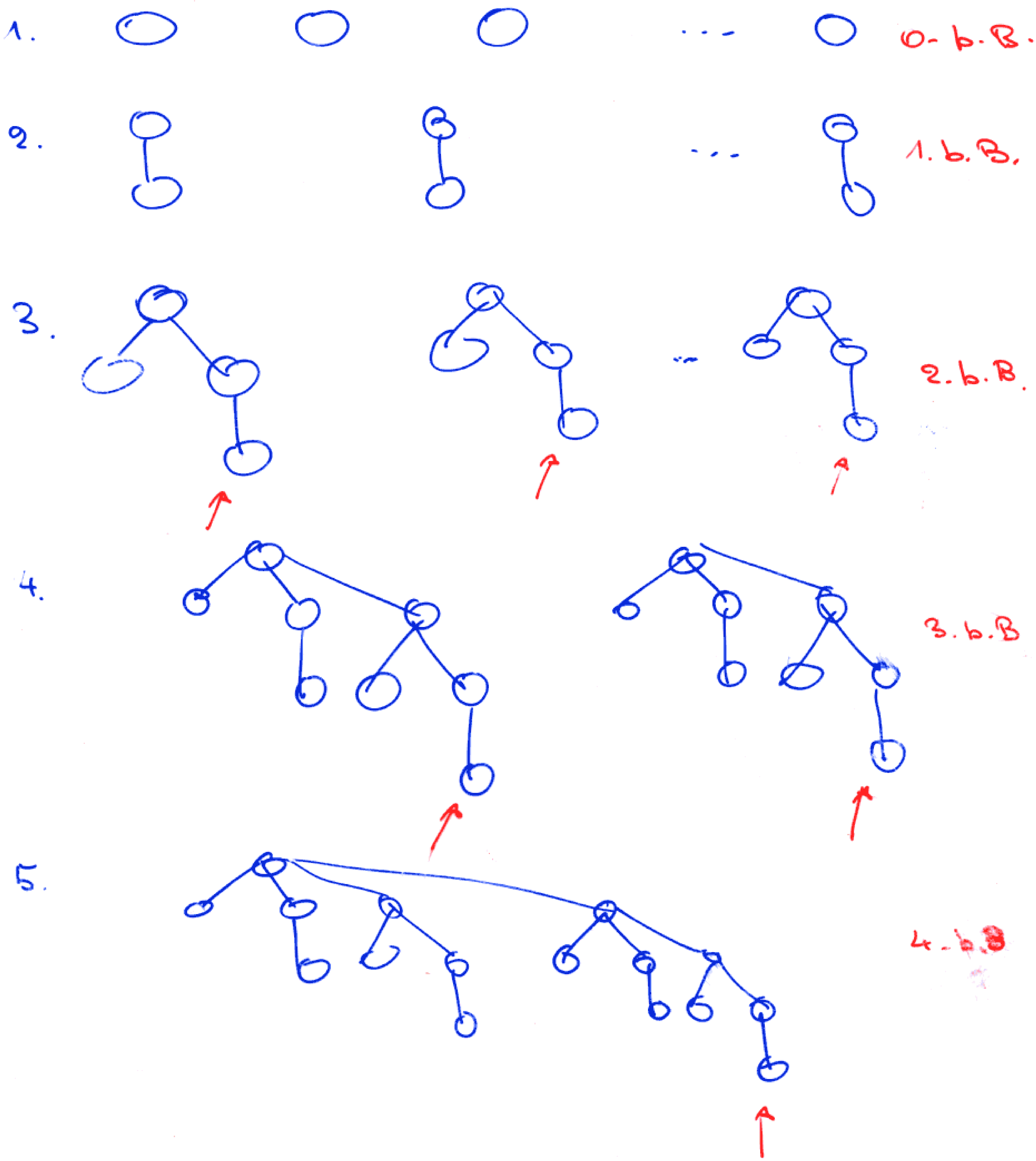
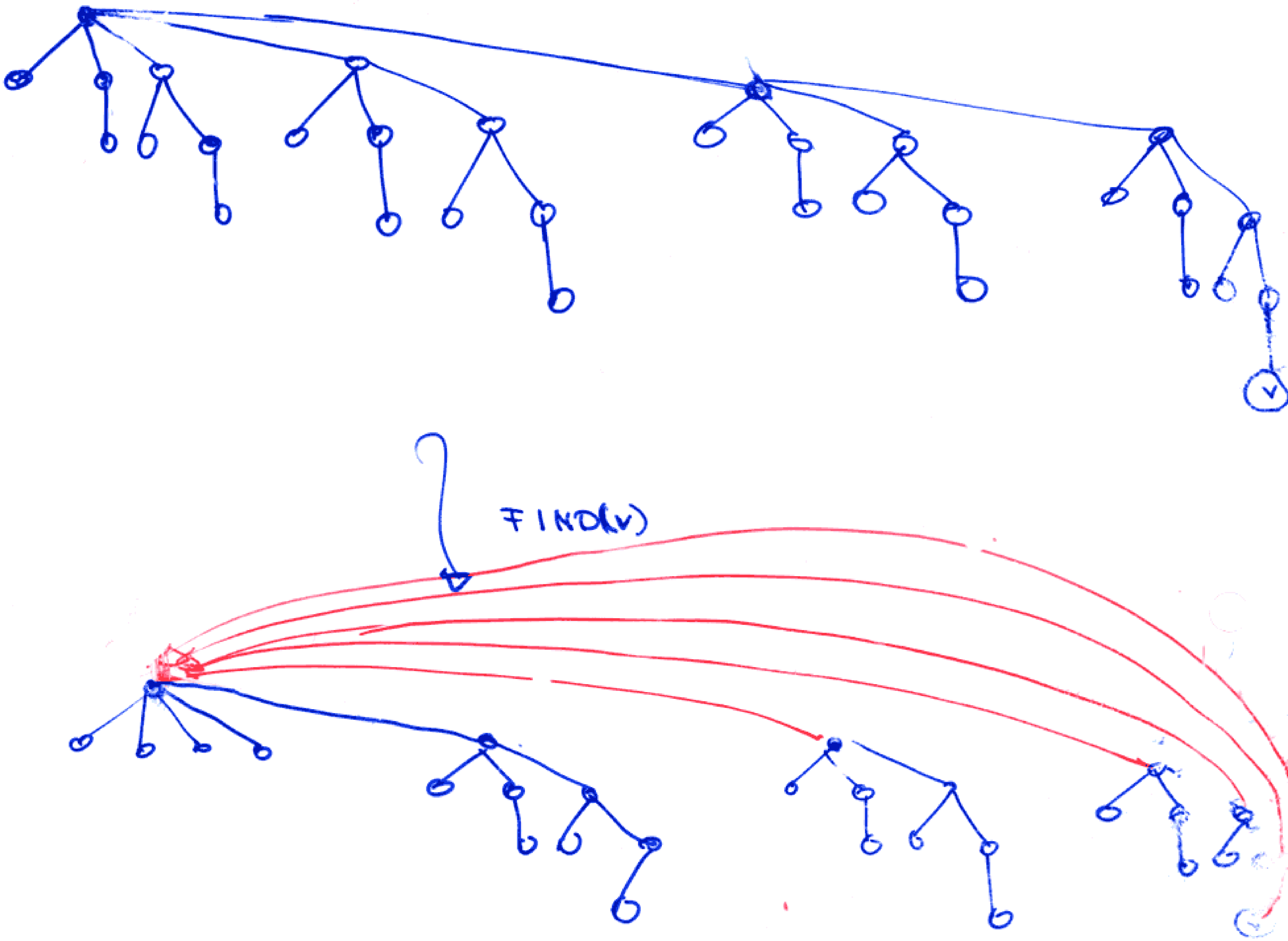


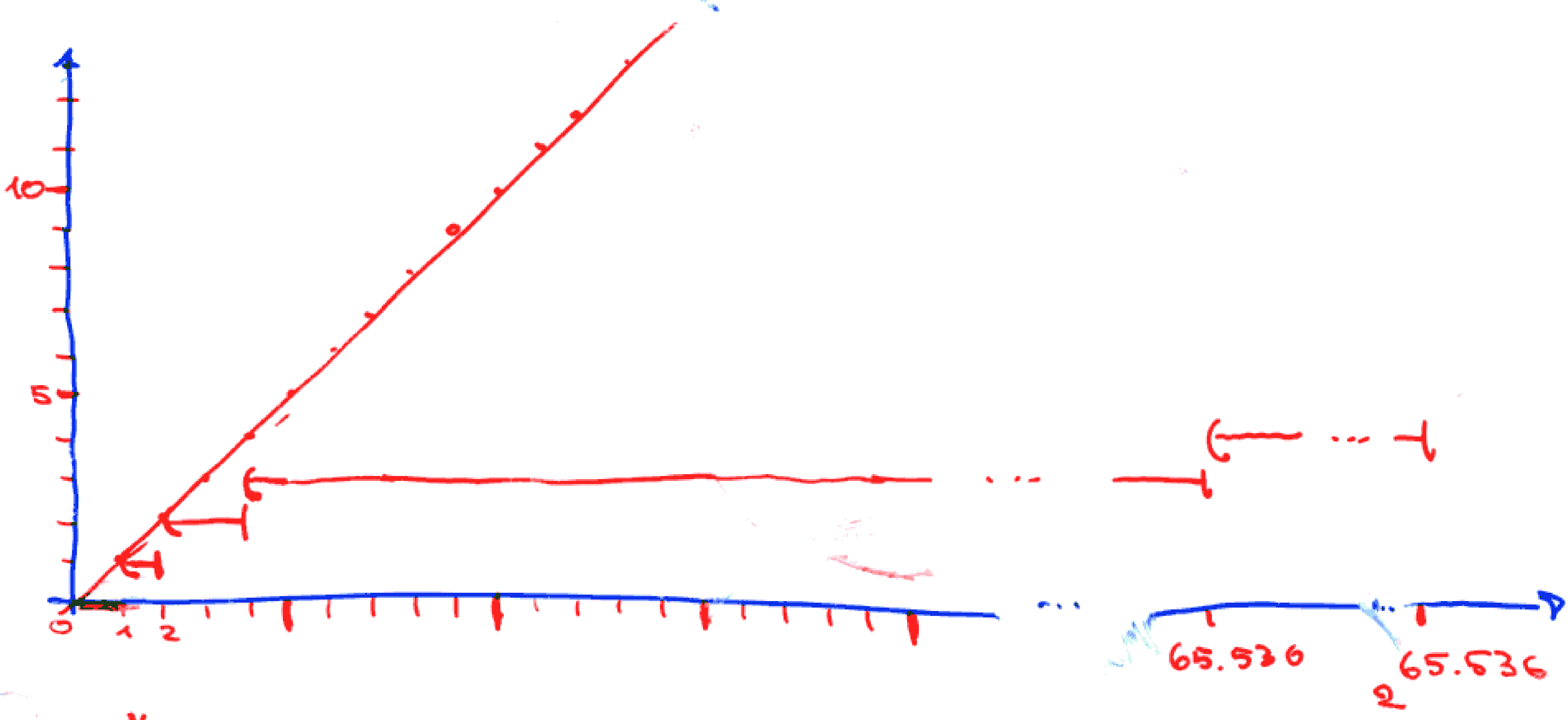
BILD 26



IN ALLGEMEINEN $\Omega(\log n)$ UND $O(\log n)$.

BILD 27

DIE FUNKTION $\log^*$:



$\log^* 1 = 0$

$\log^* 2 = 1$ „FAST" KONSTANT.

$\log^* 3 = 2$

$\log^* 4 = 1 + \log^* 2 = 2$

$\log^* 5 = 3$

$\log^* 8 = \log^* 3 + 1 = 3$

$\log^* 16 = \log^* 4 + 1 = 3$

$\log^* 2^{16} = 4$

$\log^* 2^{(2^{16})} = 5$ $\quad 2^{16} = 65.536$

$$\log^* n = \min\{ s \mid \log^{(s)}(n) \leq 1 \}$$

$$\log^{(s)}(n) = \underbrace{\log(\log(\ldots(\log}_{s\text{-MAL.}}(n))\ldots))$$

MIT UNION-BY-SIZE UND WEGKOMPRESSION

MIT UNION-BY-SIZE OHNE WEGKOMPRESSION

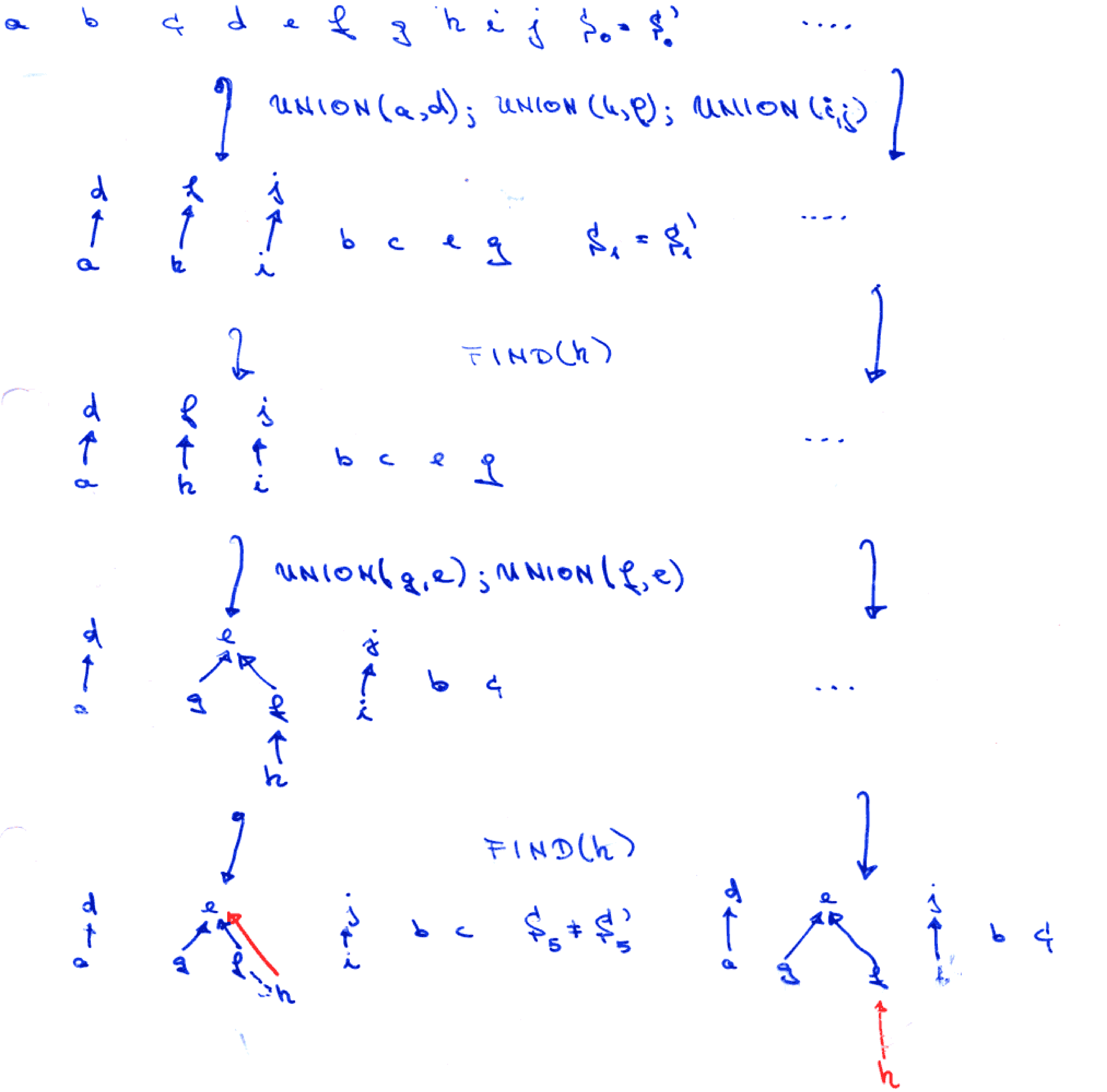
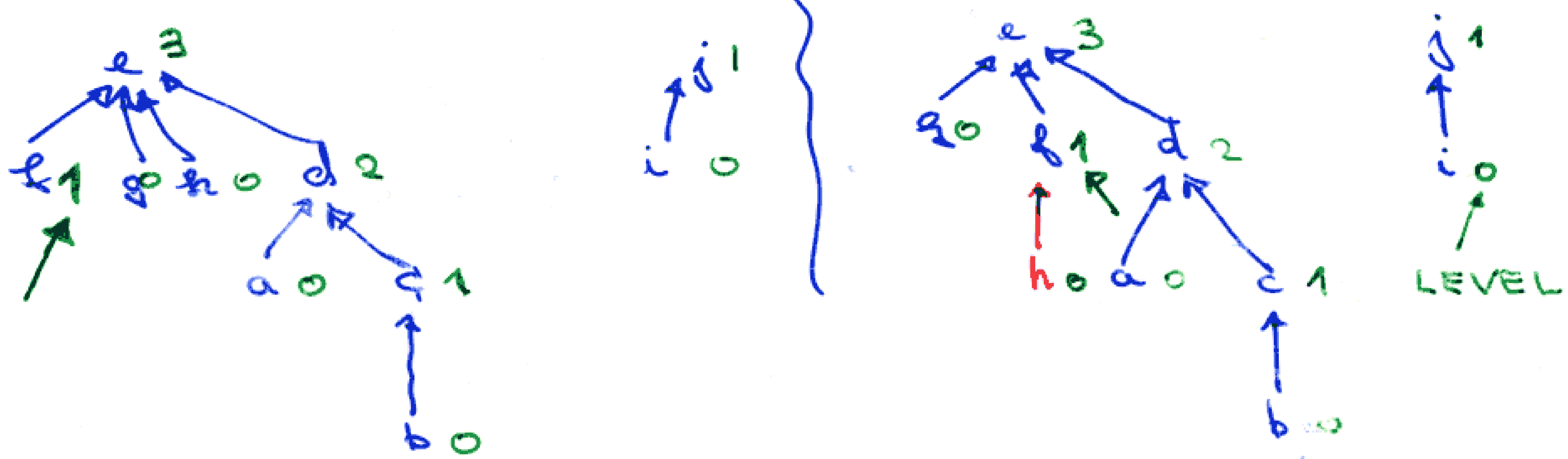


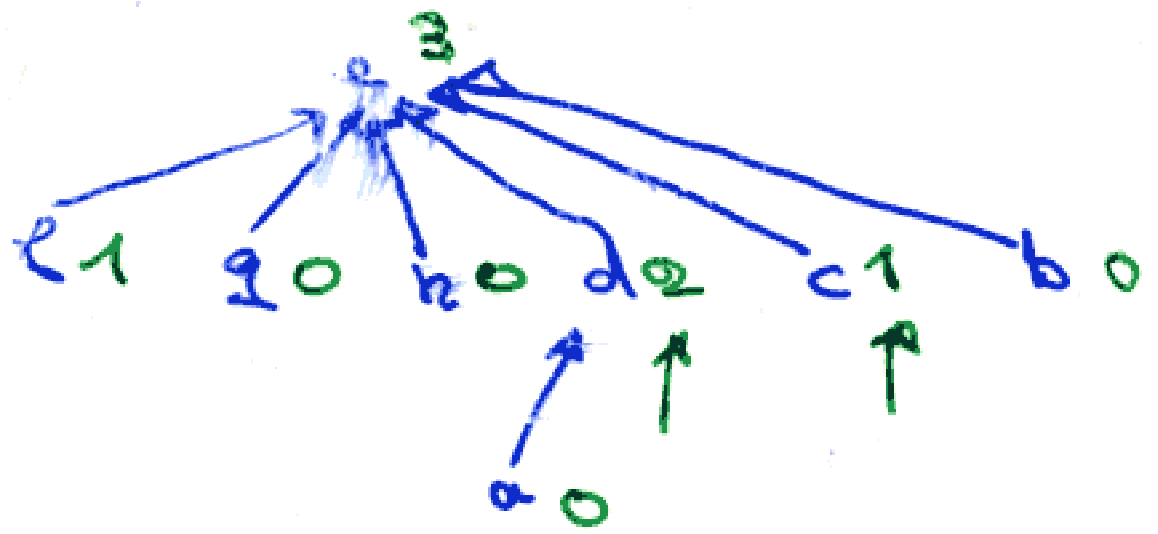
BILD 21

UNION(b,c); UNION(c,d)

UNION(d,e)



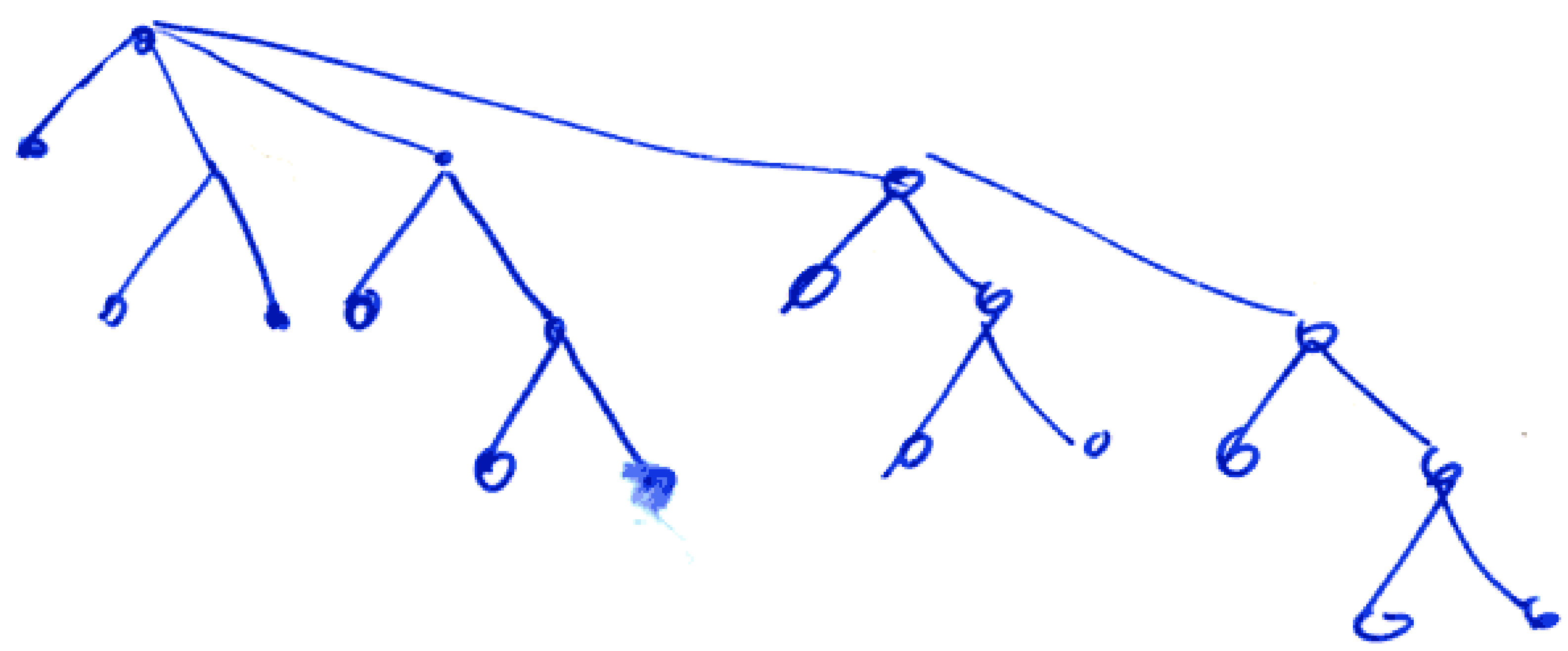
FIND(b)



...

BILD 30

IN S'_m :



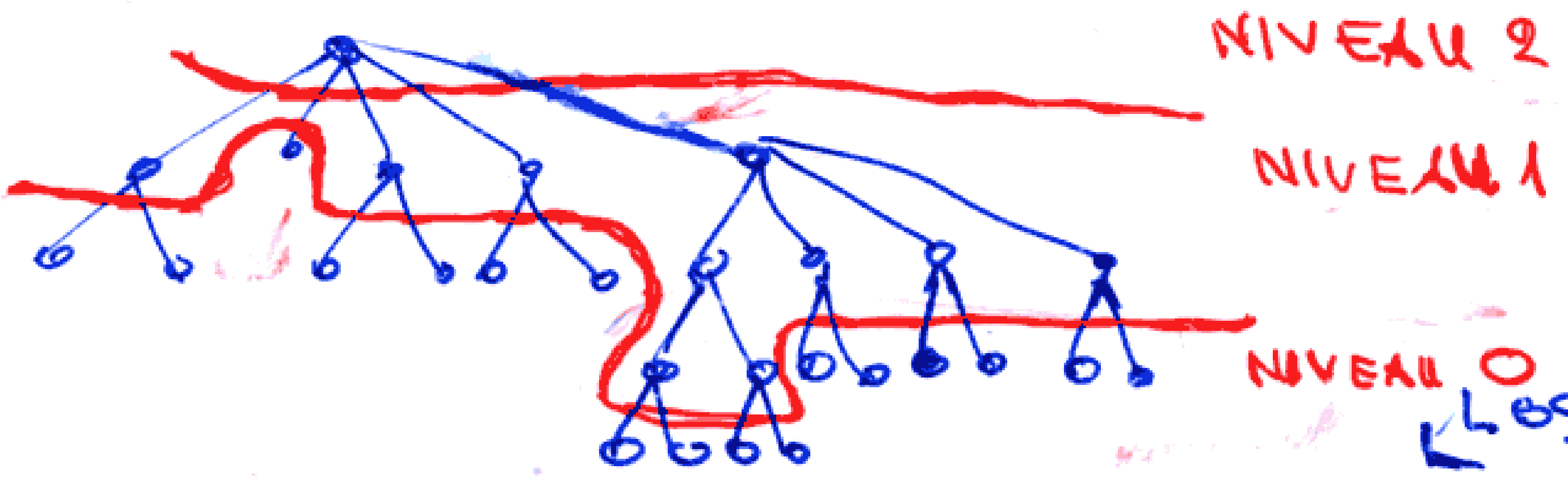
$n = 20$,

$\lfloor \log_2 n \rfloor = 4$, $4+2=6$

$\lambda_0 = 6$, $\lambda_1 = 2$, $\lambda_2 = 4$

BILD 31

ϱ_m' AUS EINEM BAUM:

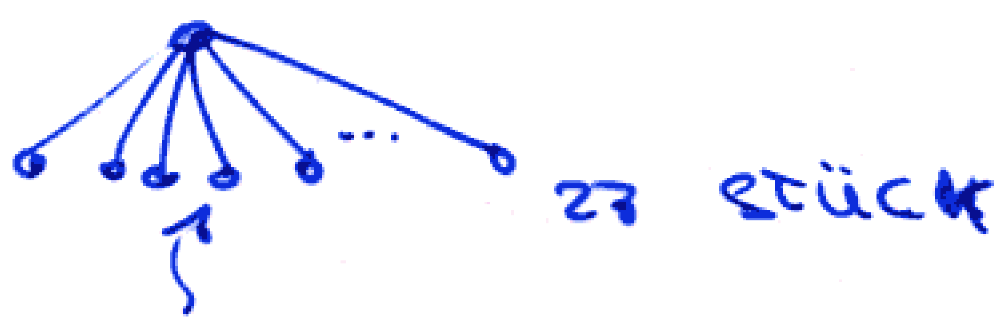


$\lfloor \log_2 28 \rfloor = 4$

$\lambda_0 = 0, \quad \lambda_1 = 1, \quad \lambda_2 = 4, \quad \lambda_3 = 5, \quad k = 2$

$\lambda_0 = 0, \quad \lambda_1 = 2, \quad \lambda_2 = 3 \quad \lambda_3 = 4, \quad \lambda_4 = 5, \quad k = 3$

BEACHTE: MÖGLICHES ϱ_m:



NIVEAUS UNTERSCHIEDLICH.