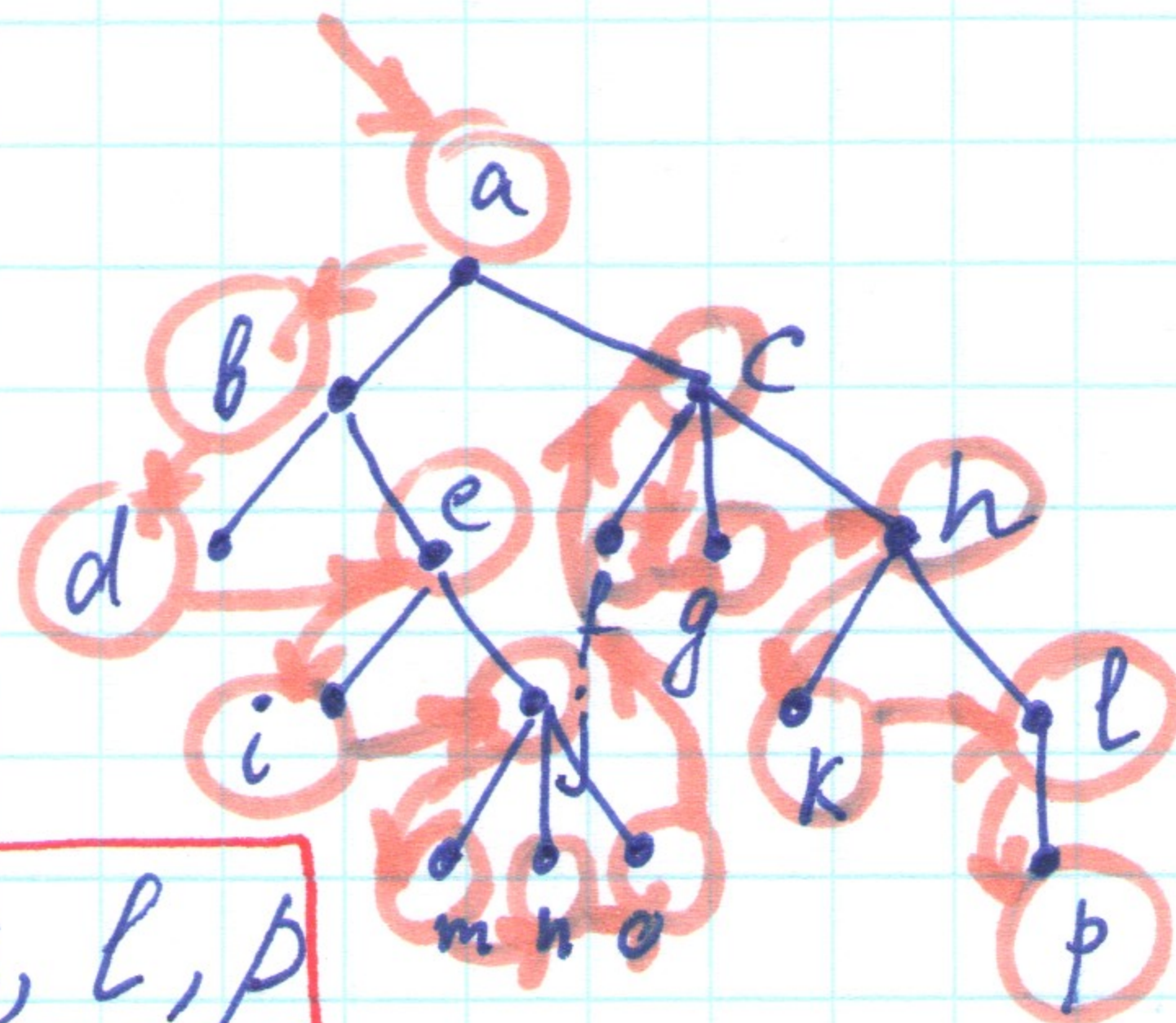


#8

pre-order : root  
left  
middle  
right

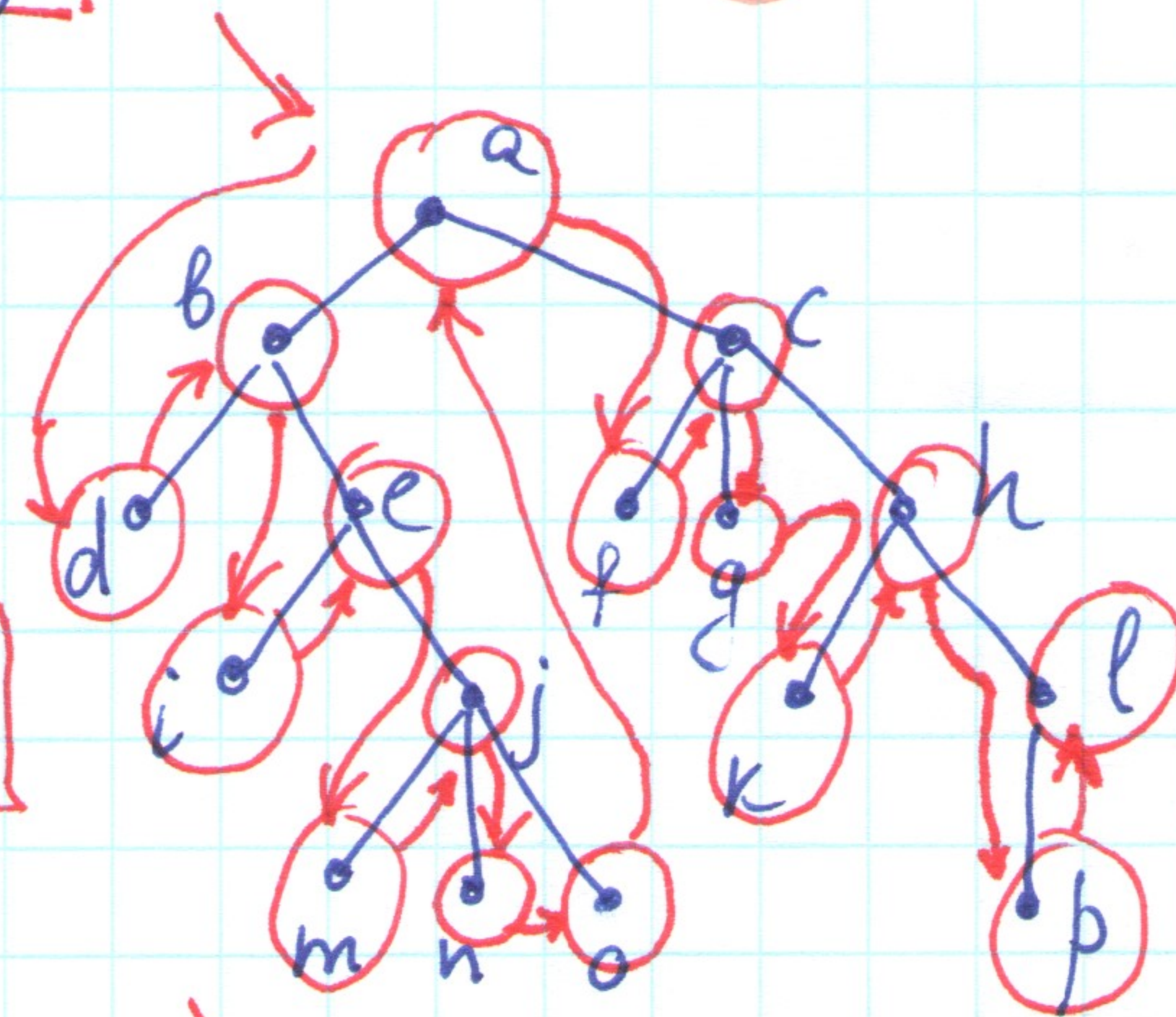
a, b, d, e, i, j, m, n, o, c, f, g, h, k, l, p



#11

inorder : first child  
root  
the rest of children

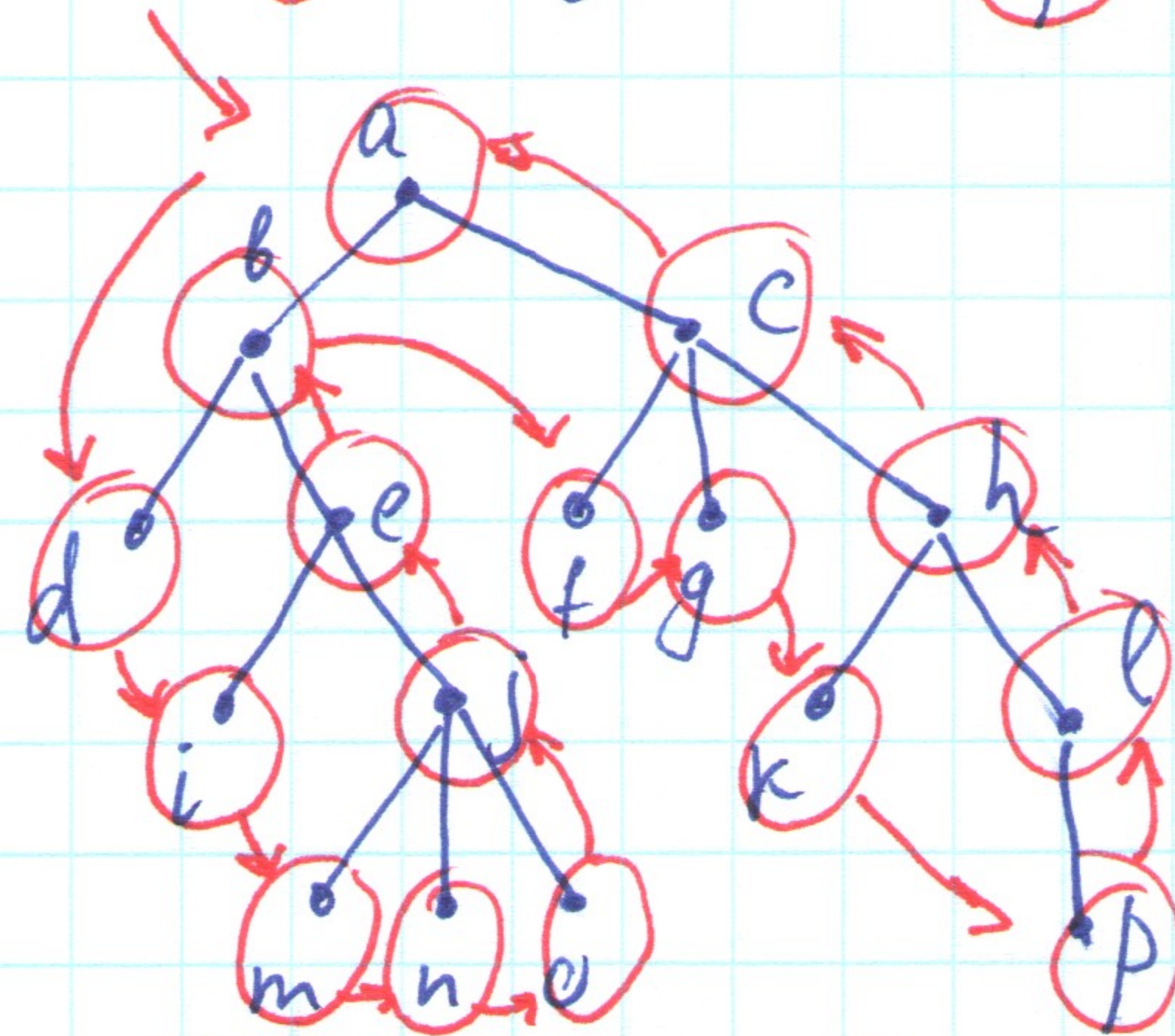
d, b, i, e, m, j, n, o, a, f, c, g, k, h, p, l



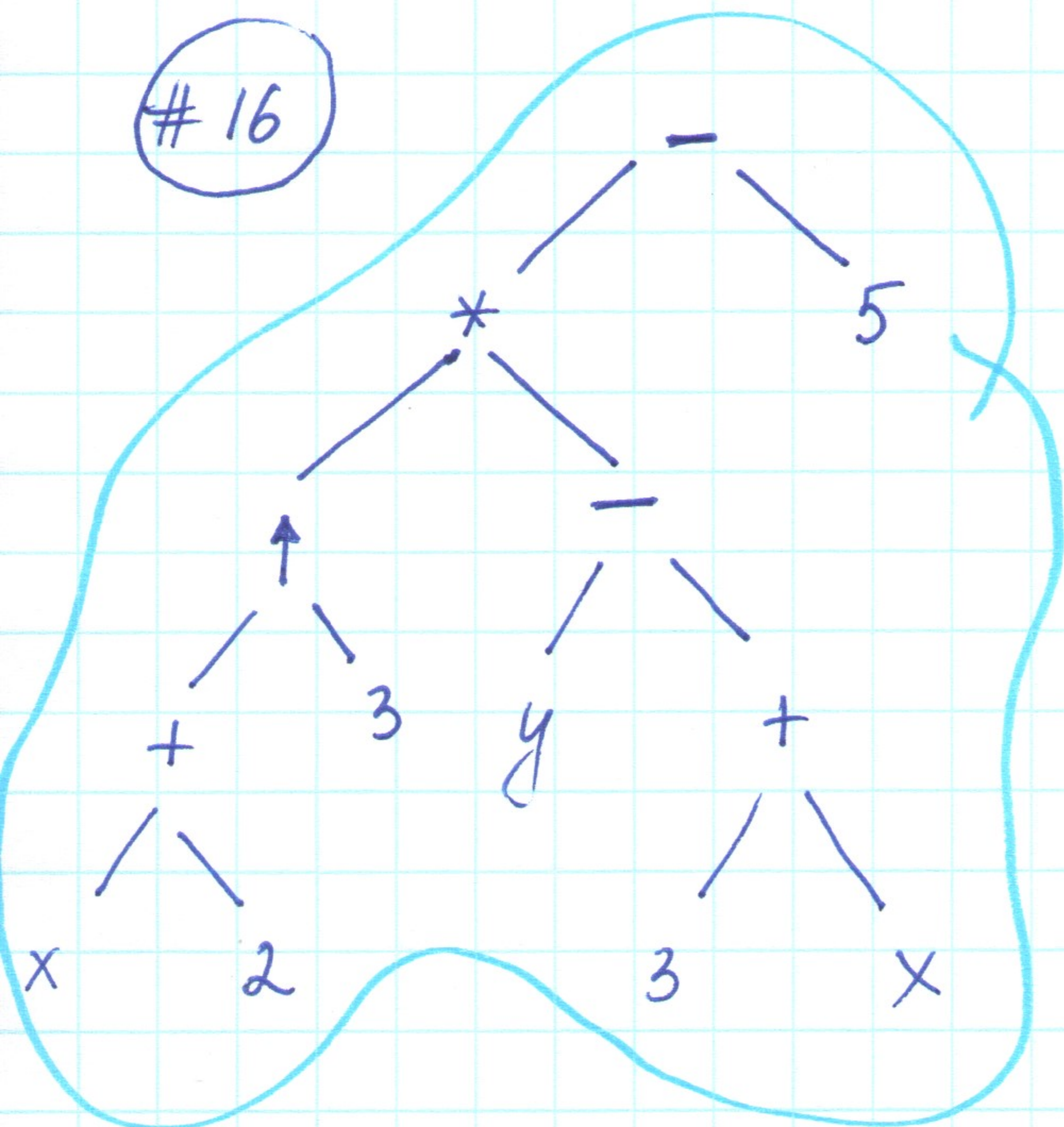
#14

postorder : children  
root

d, i, m, n, o, j, e, b, f, g, k, p, l, h, c, a



#16



a) prefix notation:

$- * \uparrow + x 2 3 - y + 3 x 5$

b) postfix notation:

$x 2 + 3 \uparrow y 3 x + - * 5 -$

c) infix notation:

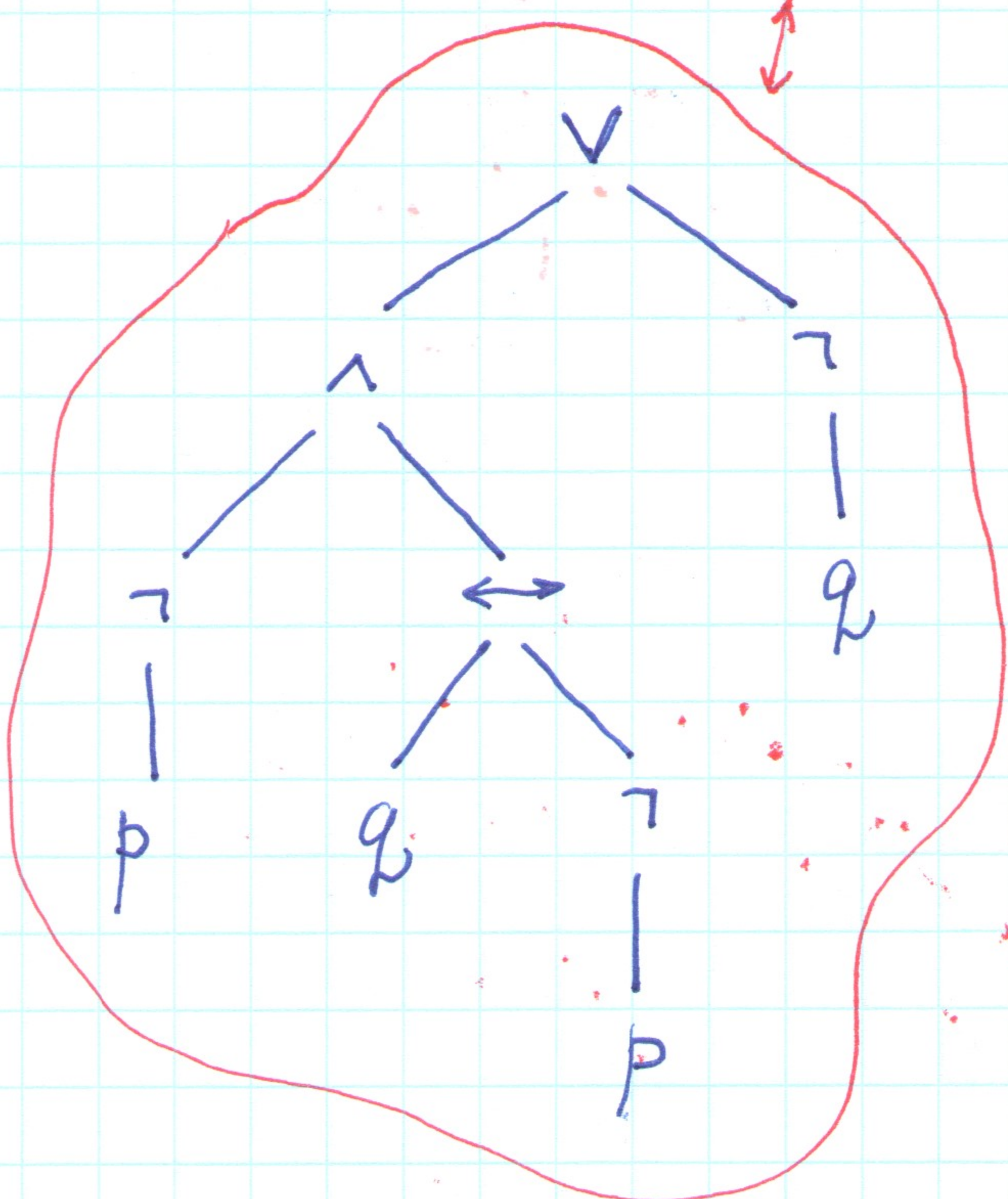
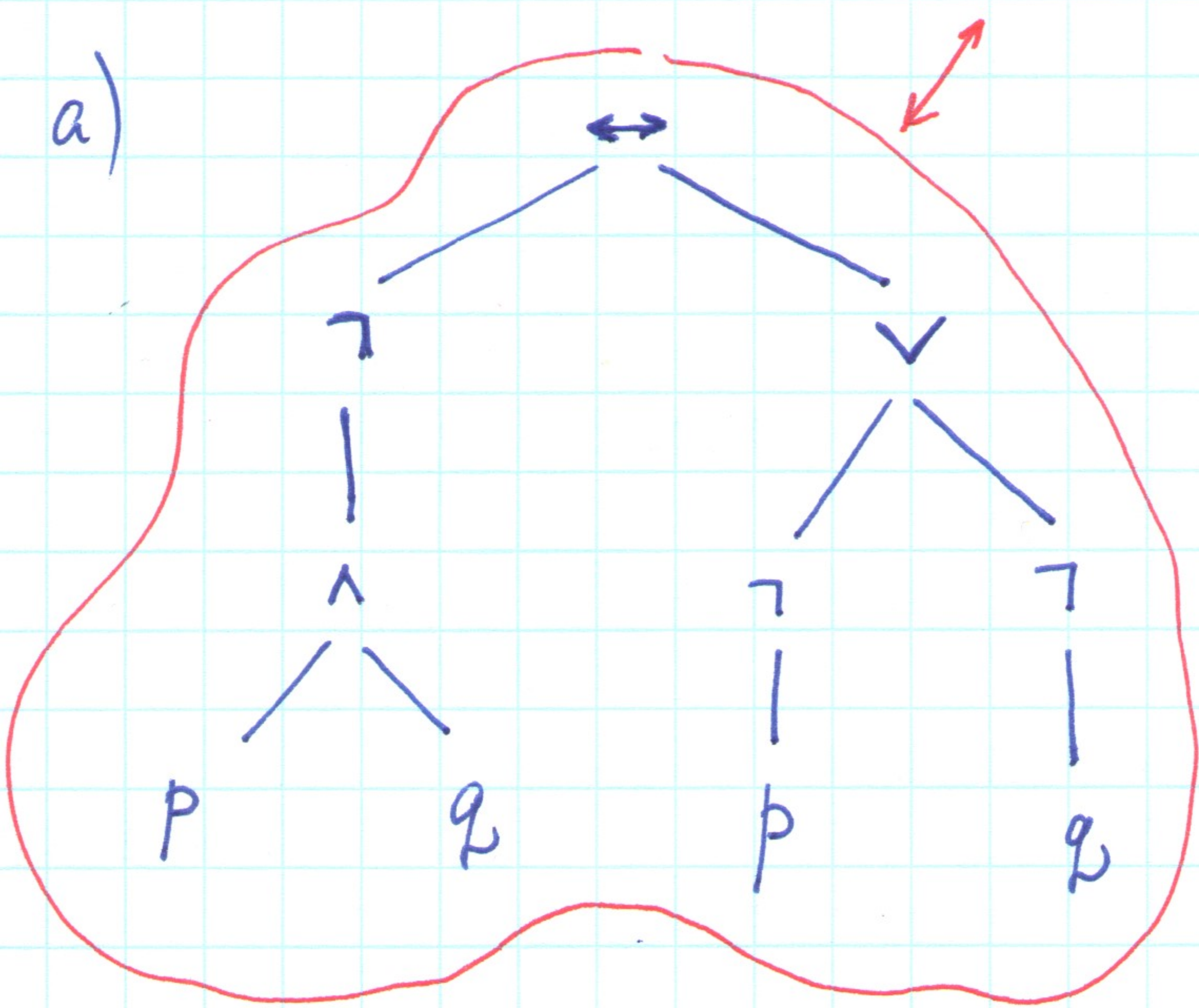
$x + 2 \uparrow 3 * y - 3 + x - 5$   
(not parenthesized)

#18

$$\neg(p \wedge q) \leftrightarrow (\neg p \vee \neg q)$$

$$(\neg p \wedge (q \leftrightarrow \neg p)) \vee \neg q$$

a)



b) prefix notation: root children

$$\leftrightarrow \neg \wedge p q \vee \neg p \neg q$$

$$\vee \wedge \neg p \leftrightarrow q \neg p \neg q$$

c) postfix notation: children root

$$p q \wedge \neg p \neg q \vee \leftrightarrow$$

$$p \neg q p \neg \leftrightarrow \wedge q \neg \vee$$

d) infix notation: left root right

$$\neg p \wedge q \leftrightarrow \neg p \vee \neg q$$

(not parenthesized)

$$\neg p \wedge q \leftrightarrow \neg p \vee \neg q$$

(not parenthesized)

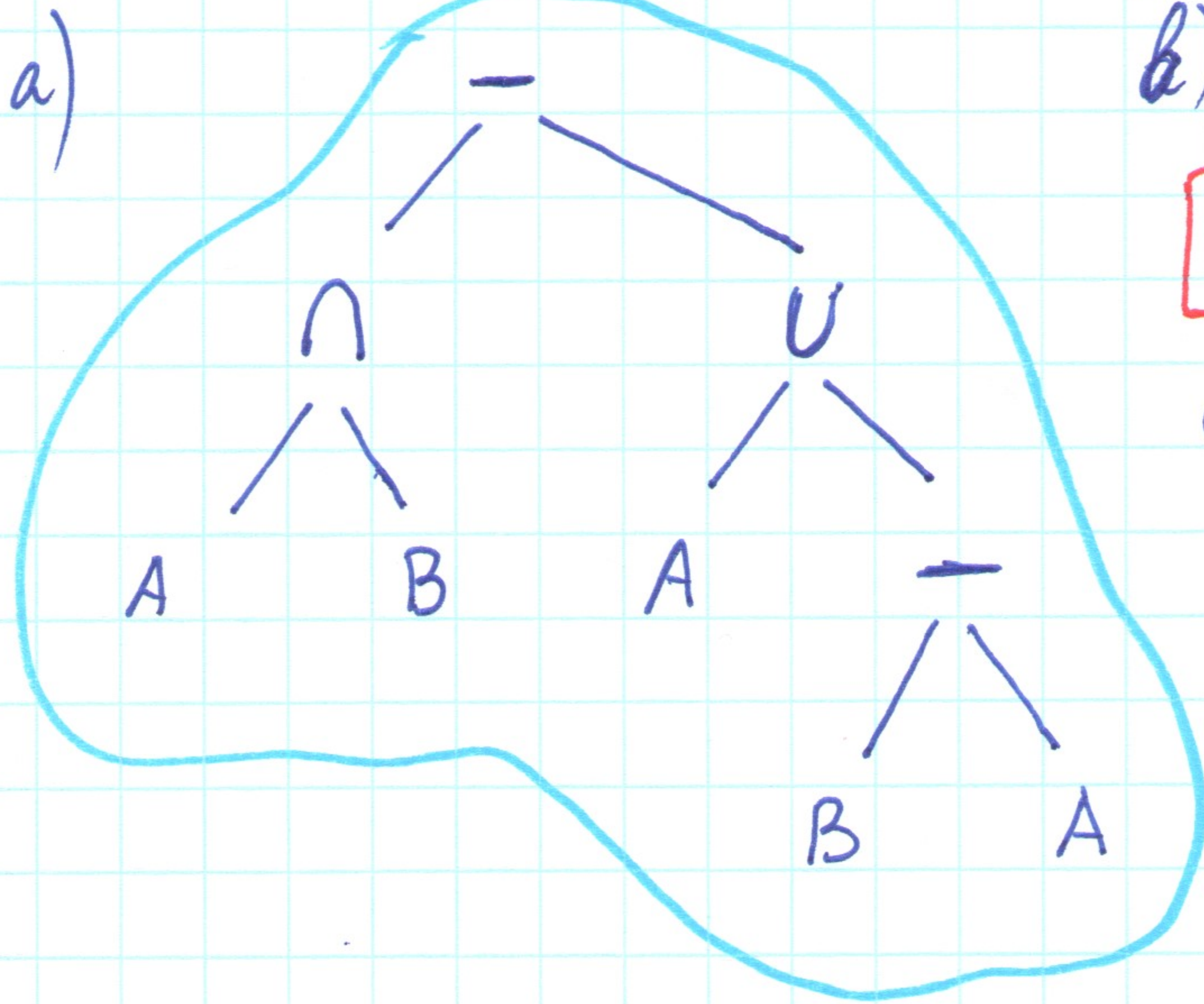
Note that here whenever we see unary operator  $\neg$

$\neg$  we follow pattern - root  
 $|$  - child  
 $p$

due to the nature of the operator  $\neg$ .

#19

$(A \cap B) - (A \cup (B - A))$



b) prefix notation:

$- \cap A B \cup A - B A$

c) postfix notation:

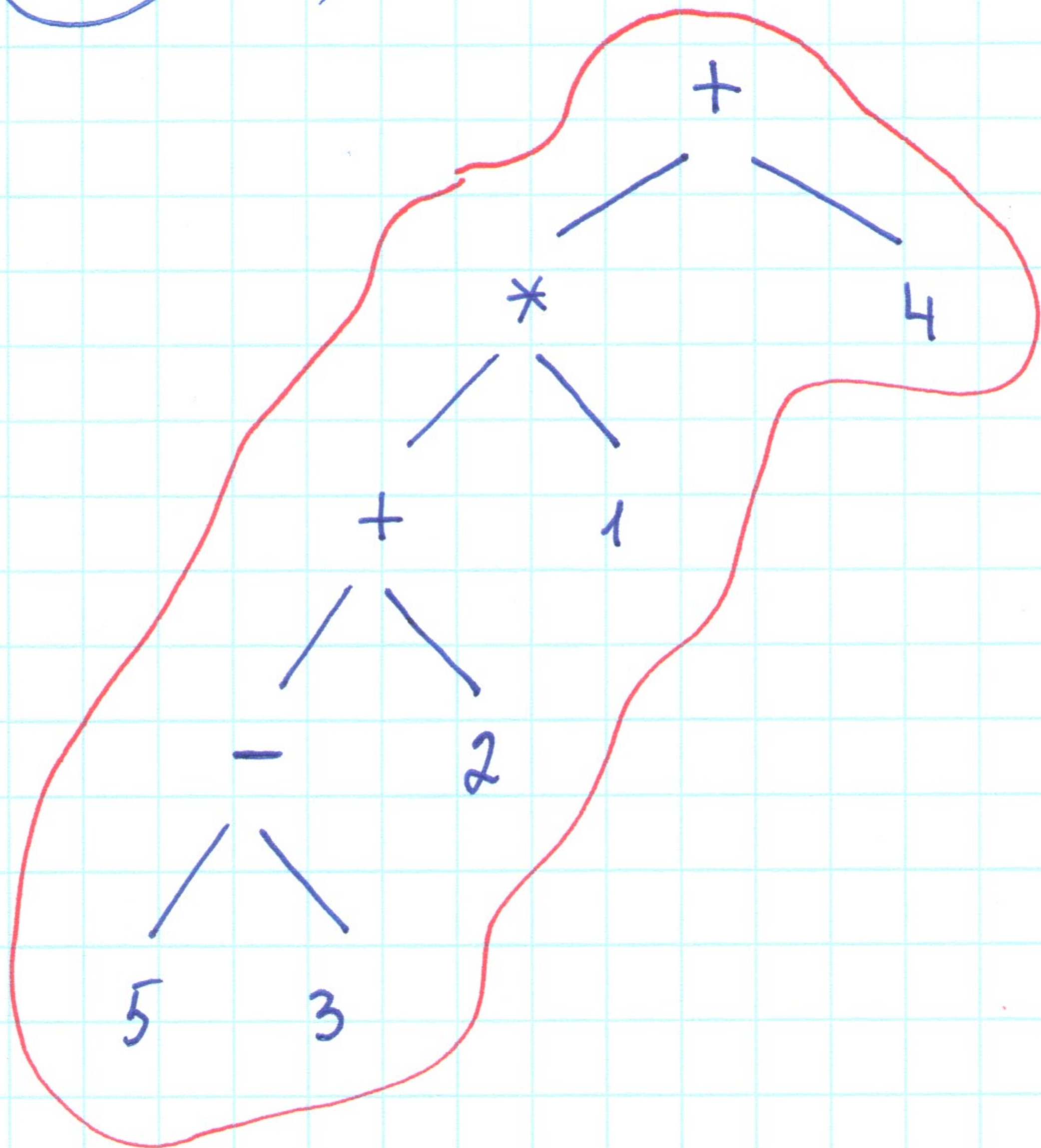
$A B \cap A B A - \cup -$

d) infix notation:  
(not parenthesized)

$A \cap B - A \cup B - A$

#22

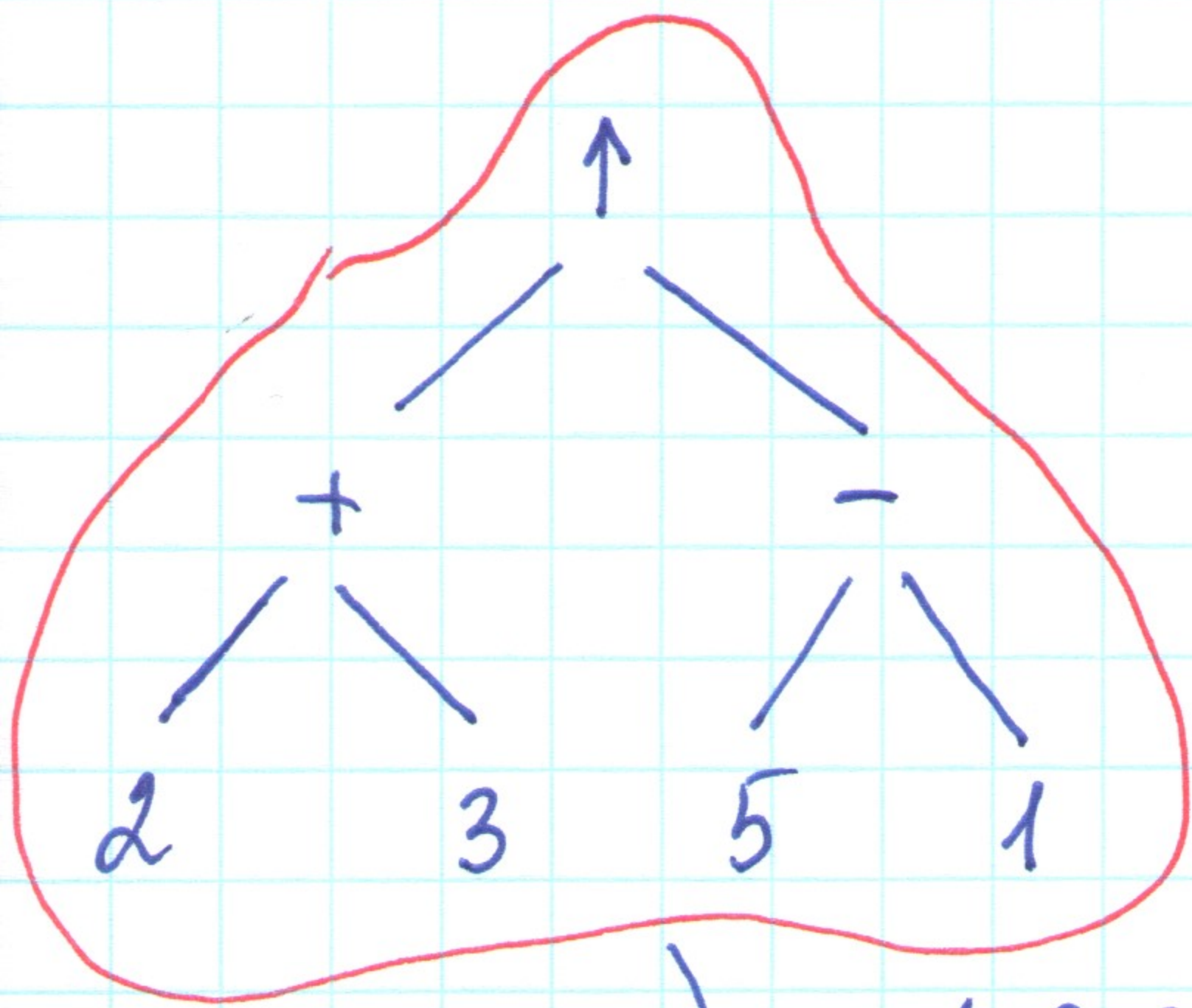
a)  $+ * + - 5 3 2 1 4$  (prefix notation)



infix notation (parenthesized)

$((5 - 3) + 2) * 1 + 4$

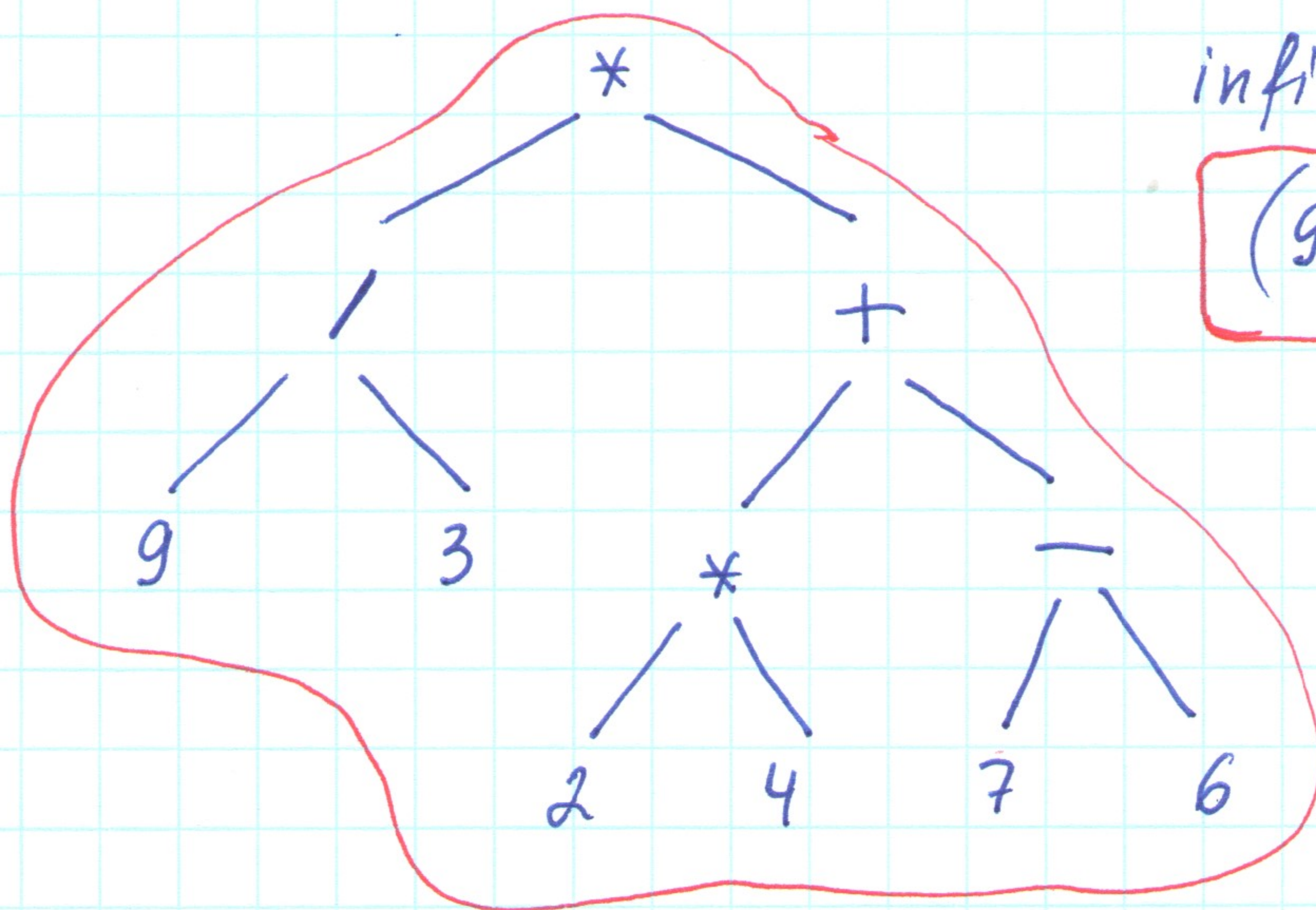
#29 b)  $\uparrow + 2 3 - 5 1$



infix notation (parenthesized):

$$(2 + 3) \uparrow (5 - 1)$$

c)  $* / 9 3 + * 2 4 - 7 6$



infix notation (parenthesized):

$$(9 / 3) * (2 * 4 + (7 - 6))$$

#24

a)  $5 \ 2 \ 1 \ - \ - \ 3 \ 1 \ 4 \ + \ + \ *$

$5 \ 1 \ - \ - \ 3 \ 1 \ 4 \ + \ + \ *$

$4 \ 3 \ 1 \ 4 \ + \ + \ *$

$4 \ 3 \ 5 \ + \ *$

$4 \ 8 \ * \ = \ 32$

b)  $9 \ 3 \ / \ 5 \ + \ 7 \ 2 \ - \ *$

$3 \ 5 \ + \ 7 \ 2 \ - \ *$

$8 \ 7 \ 2 \ - \ *$

$8 \ 5 \ * \ = \ 40$

c)  $3 \ 2 \ * \ 2 \ \uparrow \ 5 \ 3 \ - \ 8 \ 4 \ / \ * \ -$

$6 \ 2 \ \uparrow \ 5 \ 3 \ - \ 8 \ 4 \ / \ * \ -$

$36 \ 5 \ 3 \ - \ 8 \ 4 \ / \ * \ -$

$36 \ 2 \ 8 \ 4 \ / \ * \ -$

$36 \ 2 \ 2 \ * \ -$

$36 \ 4 \ -$

$= \ 32$