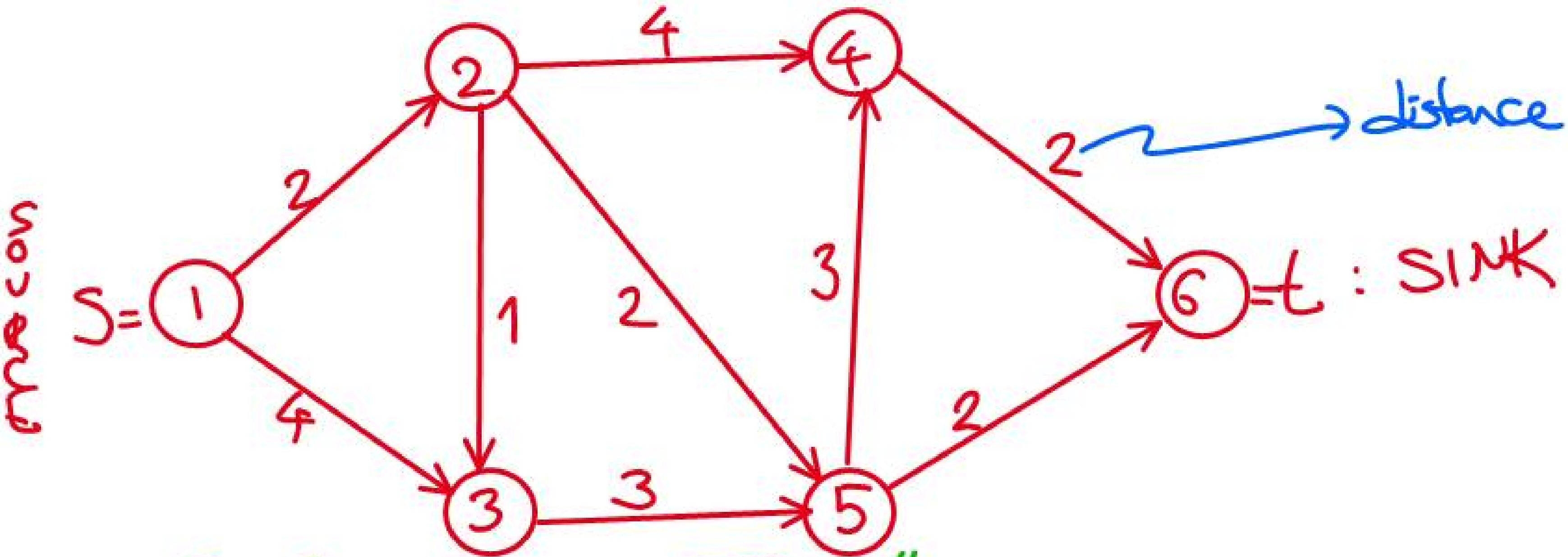


α - β "CLOSEST FIRST"

1 : 2, 3

2 : 3, 5, 4

3 : 5

4 : 6

5 : 6, 4

6 : ||

SHORTEST PATH

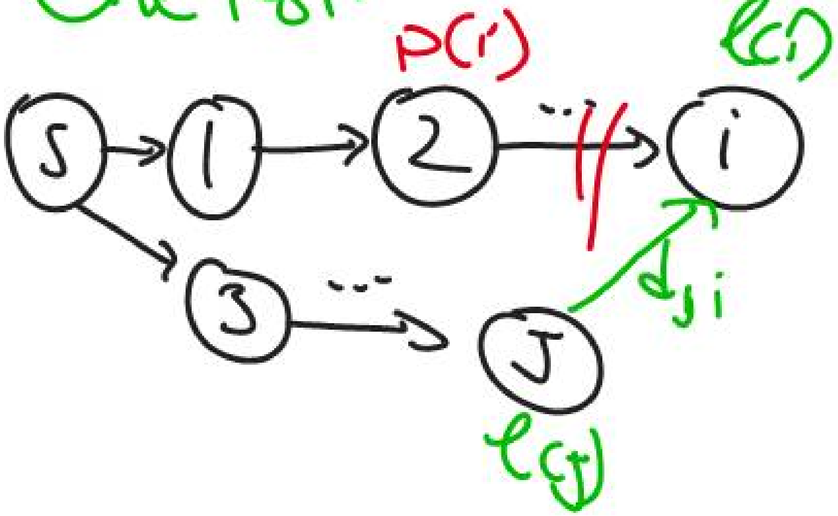
Two Labels: parent(i): the previous (parent) node on the shortest path from the source

p(i)

label(i): the current shortest distance from the source node

l(i)

One test:

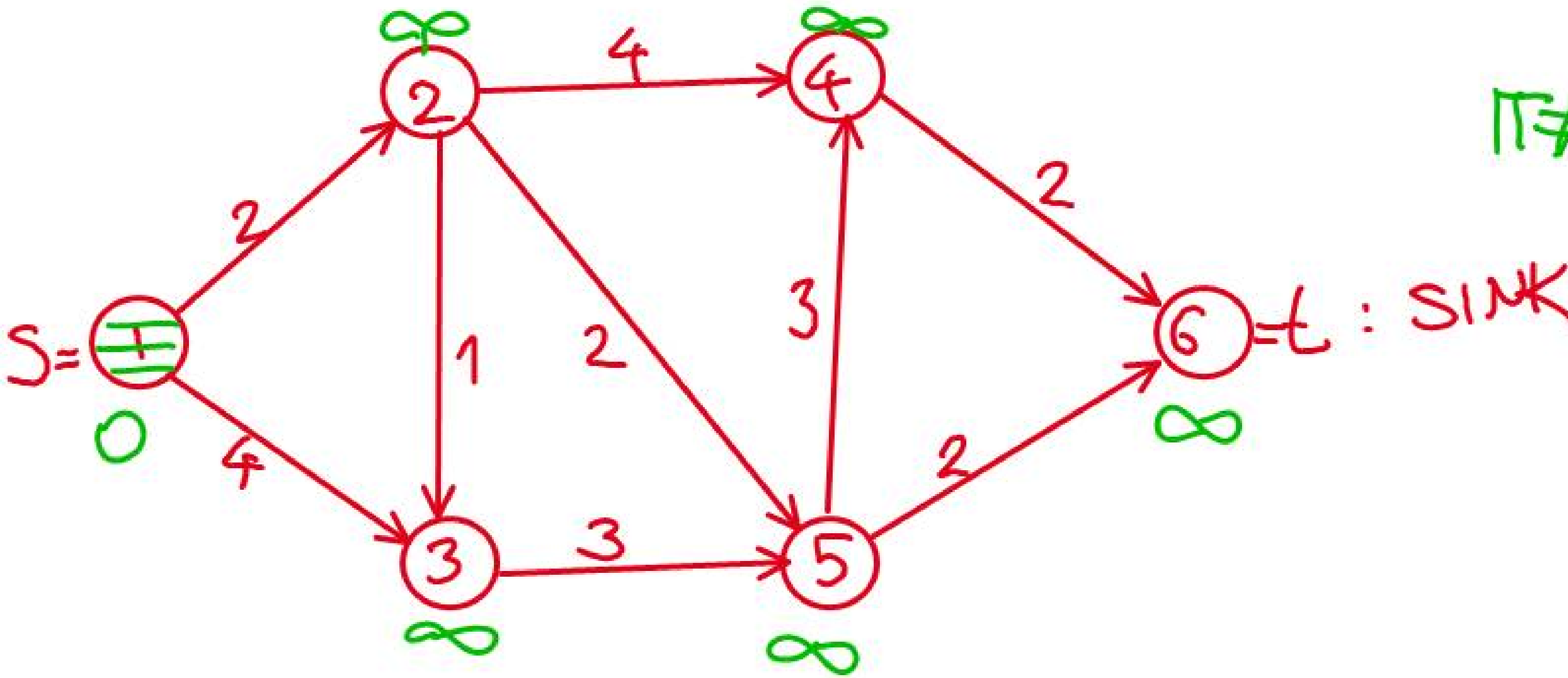


$l(i) \overset{?}{>} l(j) + d_{ji}$

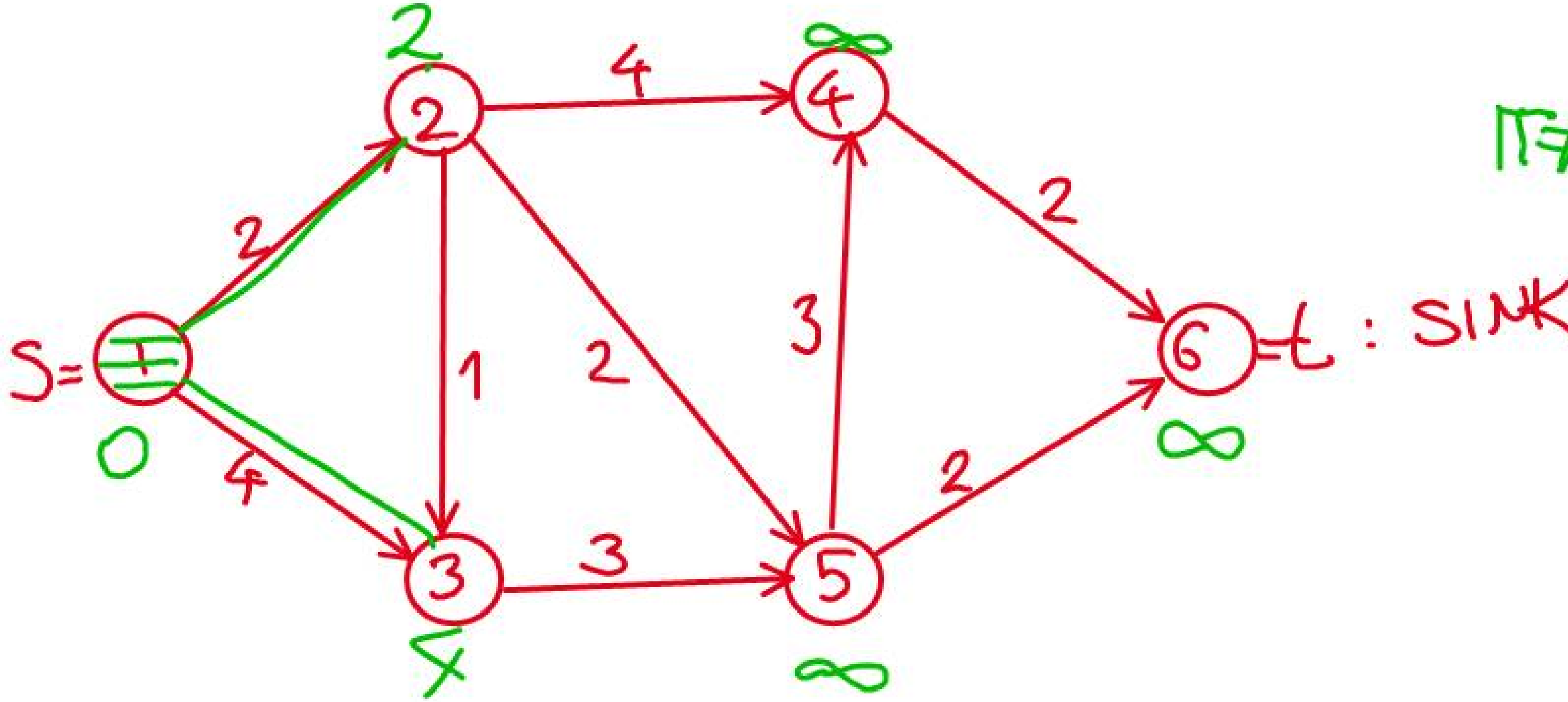
YES → update (the route to i through j is shorter)

$l(i) \leftarrow l(j) + d_{ij}$

$p(i) \leftarrow j$

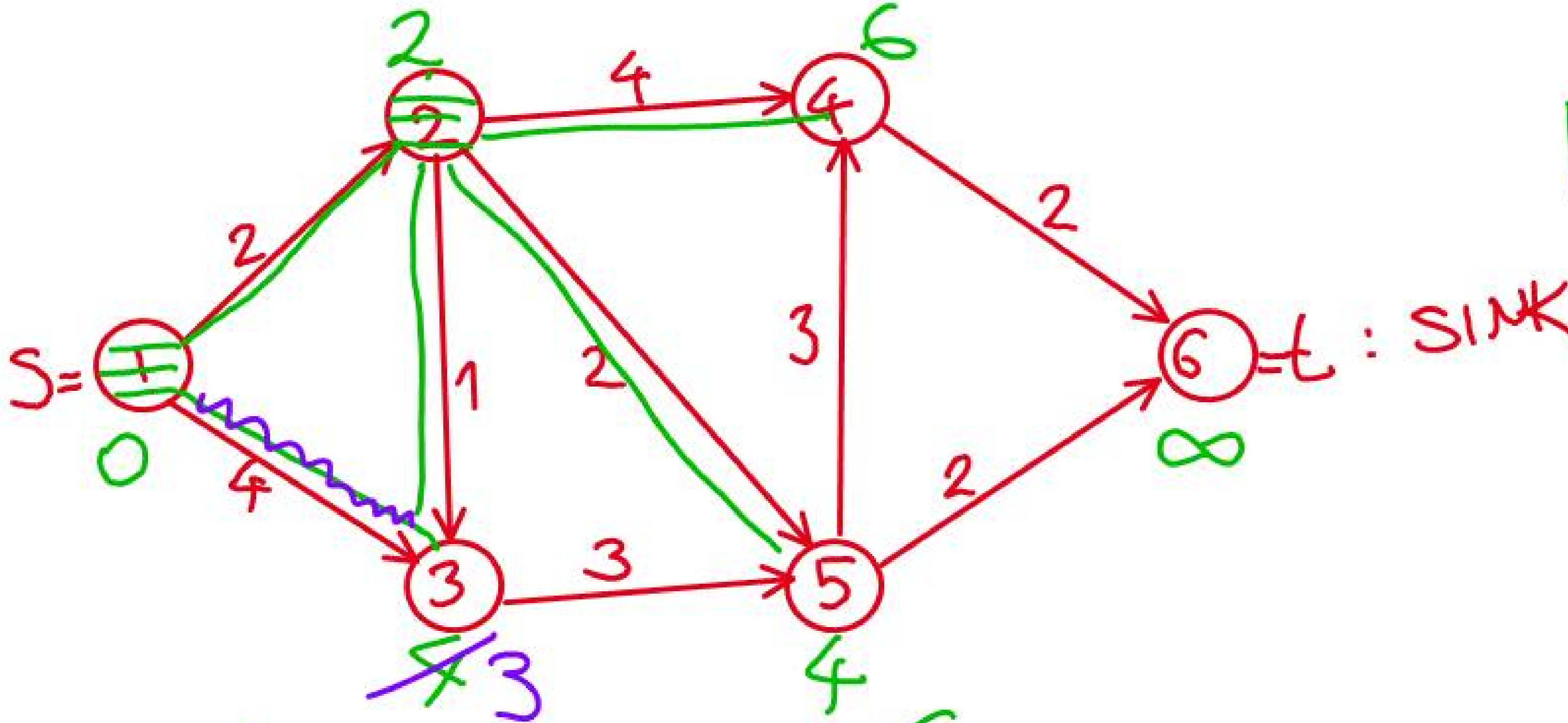


S=1
0
2
4
1
2
3
3
4
5
6=t : SINK
2
2
4
2
3
∞
∞
∞
∞
∞
IT#0

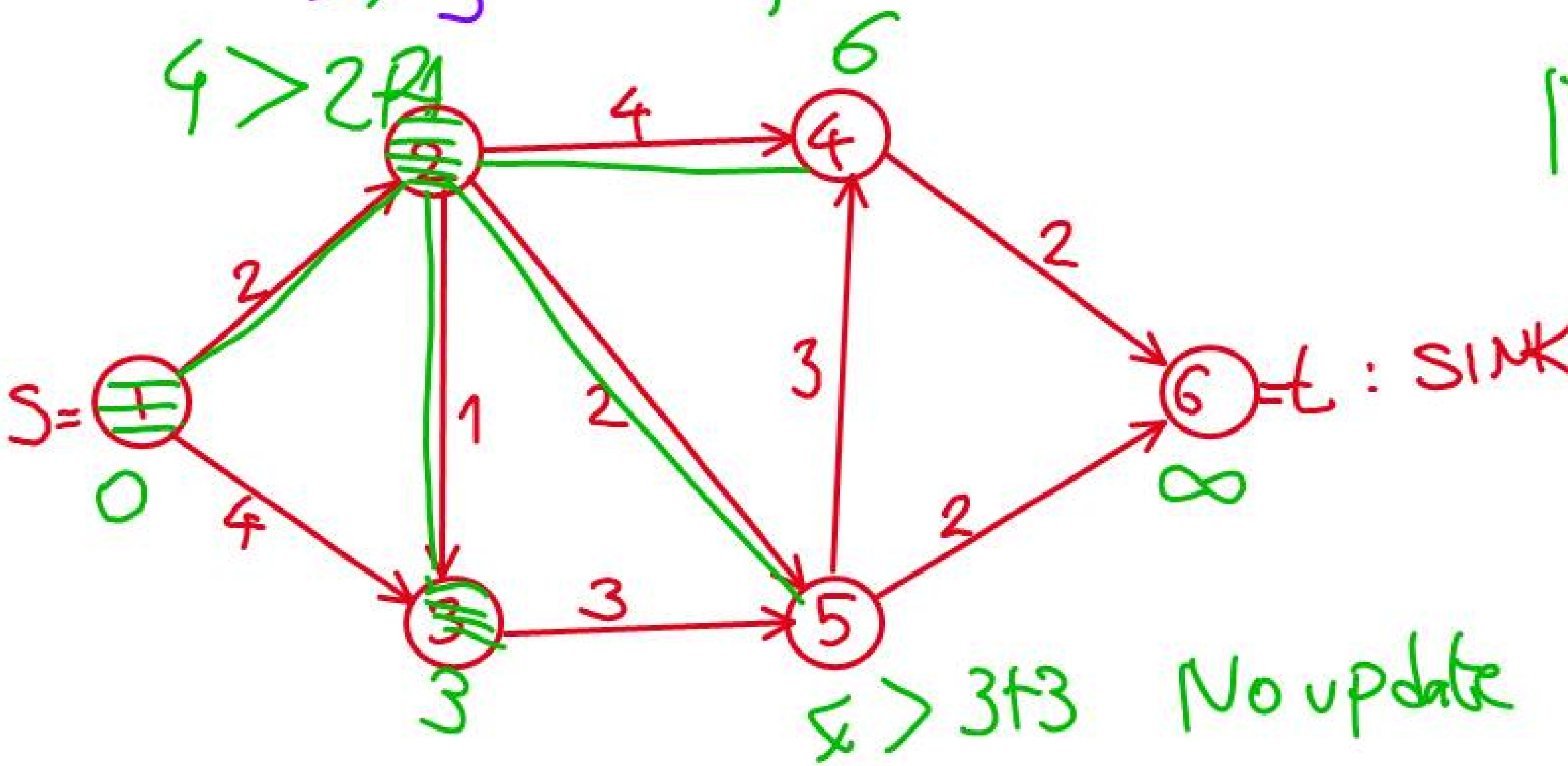


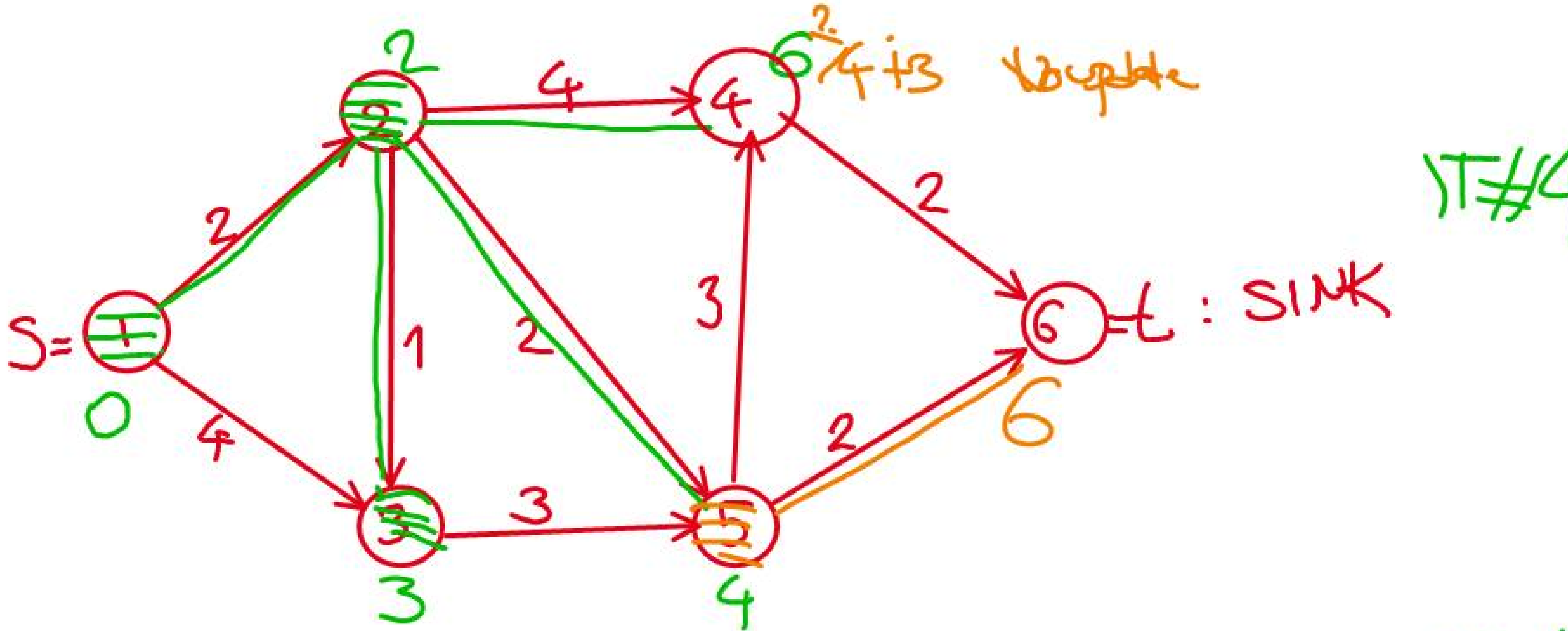
S=1
0
2
4
1
2
3
3
4
5
6=t : SINK
2
2
4
2
3
2
4
∞
∞
∞
IT#1

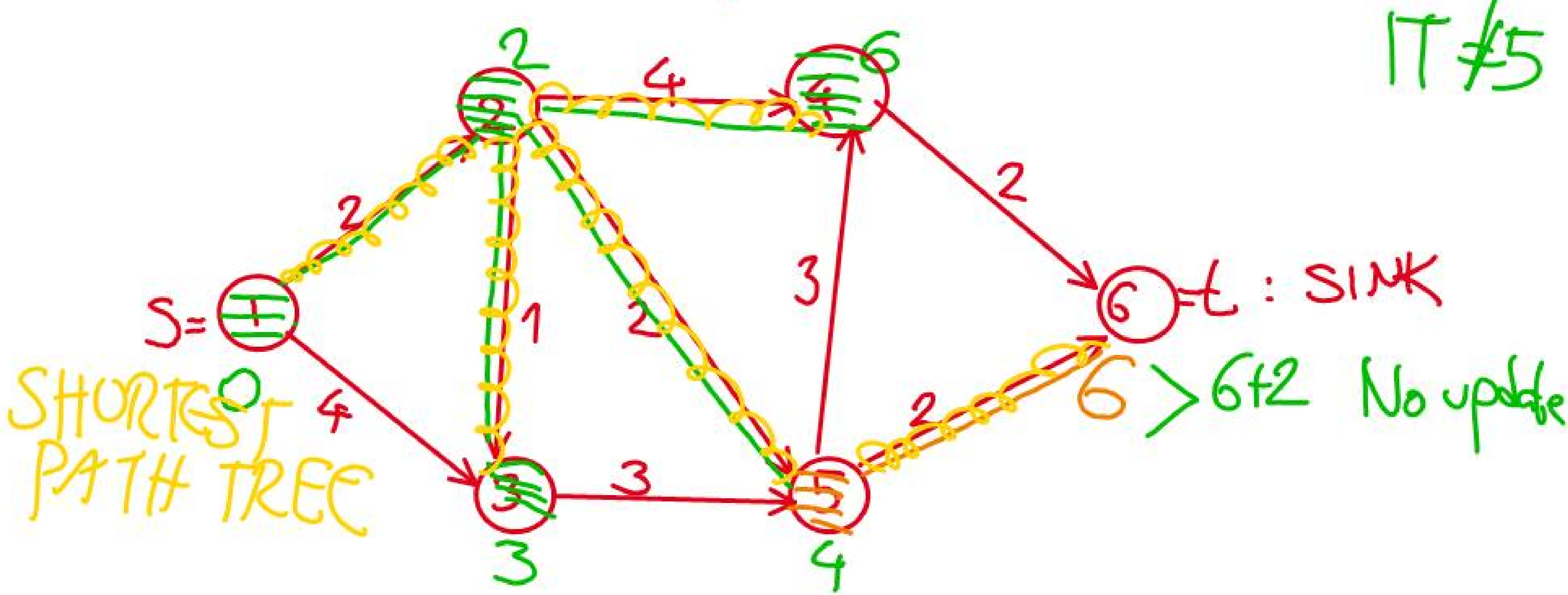
IT#2



IT#3




IT#4
S=
t : SINK
6 ? 4+3 No update
2
4
3
1
6

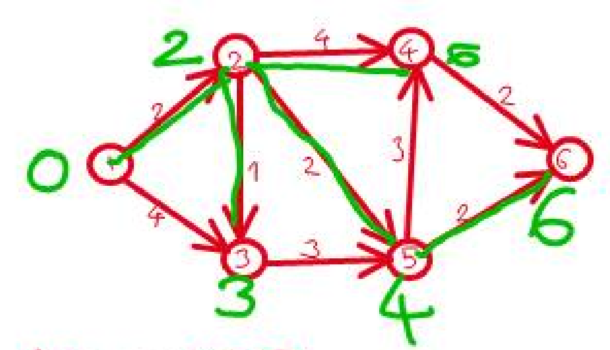

IT#5
S=
t : SINK
6 > 6+2 No update
SHORTEST PATH TREE

1: 2, 3
2: 3, 5, 4
3: 5
4: 6
5: 6, 4
6: ||

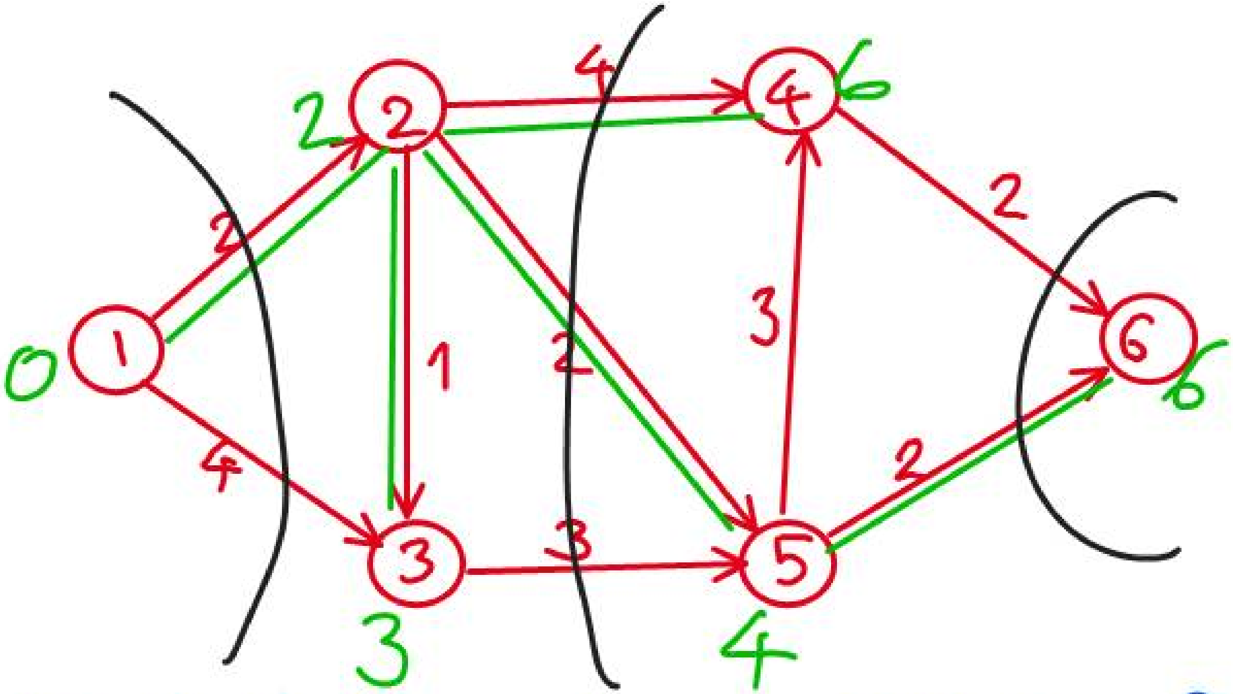
$l(i) \overset{?}{>} l(j)+d_{ji}$

YES → update p(i) & l(i)

SP Tree



IT #	NODE i	p(i)	l(i)	Neighb	Queue	UPDATES
1	1	—	0	2 3	3 2 ~~1~~	$l(2)=\infty > l(1)+d_{12}=0+2$ $l(2) \leftarrow 2$ $p(2) \leftarrow 1$ $l(3) \leftarrow 4$ $p(3) \leftarrow 1$
2	2	1	2	3 5 4	4 5 3 ~~2~~	$4 > 2+1 \Rightarrow l(3)=3$ $p(3) \leftarrow 2$ $l(5)=4$ $p(5)=2$ $l(4)=6$ $p(4) \leftarrow 2$
3	3	2	3	5	4 5 ~~3~~	$4 \overset{?}{>} 3+3$ No update
4	5	2	4	6 4	6 4 ~~5~~	$6 > 4+3$ No update $l(6)=6$ $p(6) \leftarrow 5$
5	4	2	6	6	6 ~~4~~	$6 > 6+2$ No update
6	6	5	6	—	~~6~~	STOP Draw SP_tree



⊛ While solving SP from 1 to 6, as a byproduct, we have solved ALL the SP problems from 1 to all other nodes.

⊛ Consider: 1 → 2 → 5 → 6 : SP

The SP from 2 to 5 is defined above
2 to 6
5 to 6

Bellman's Principle

2 → DYNAMIC PROGRAMN