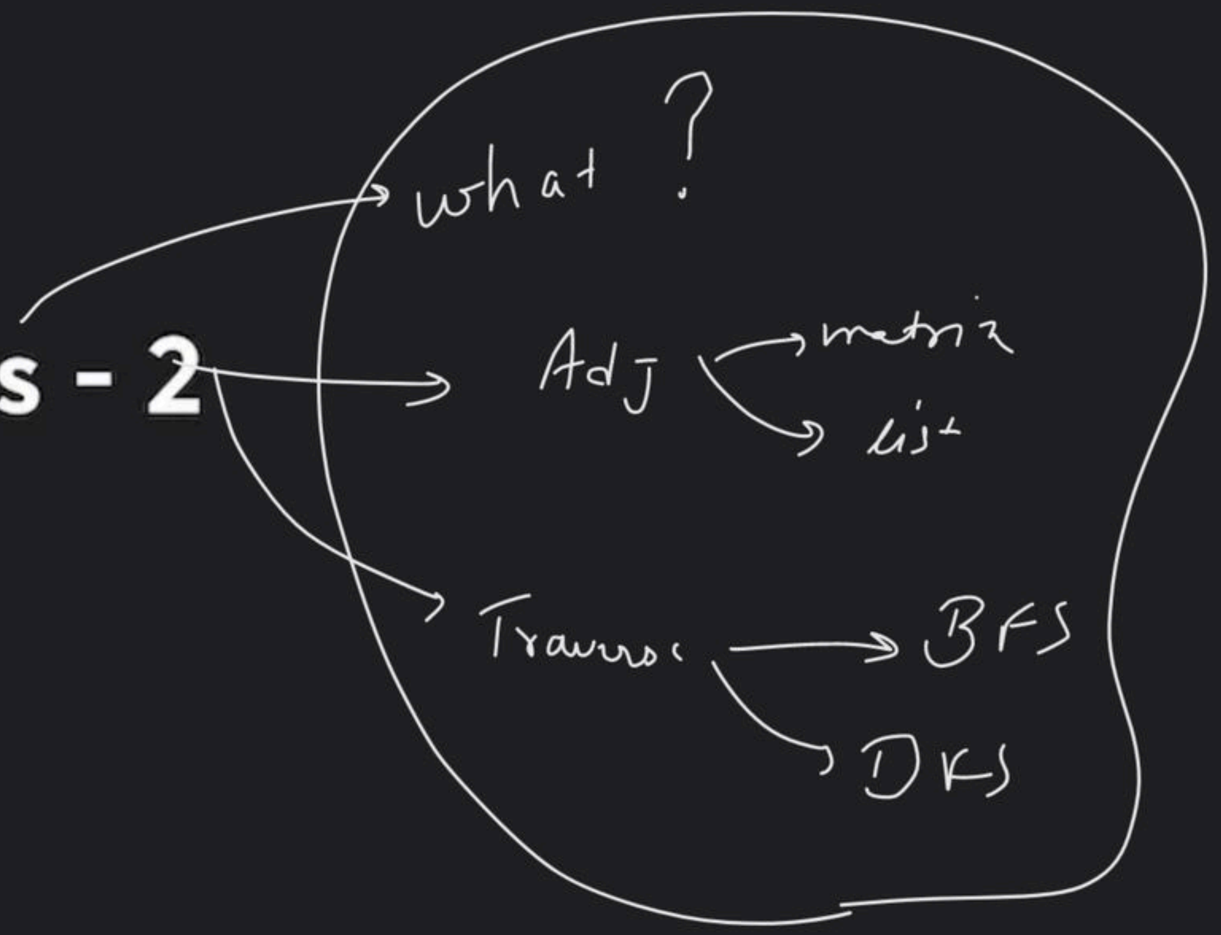
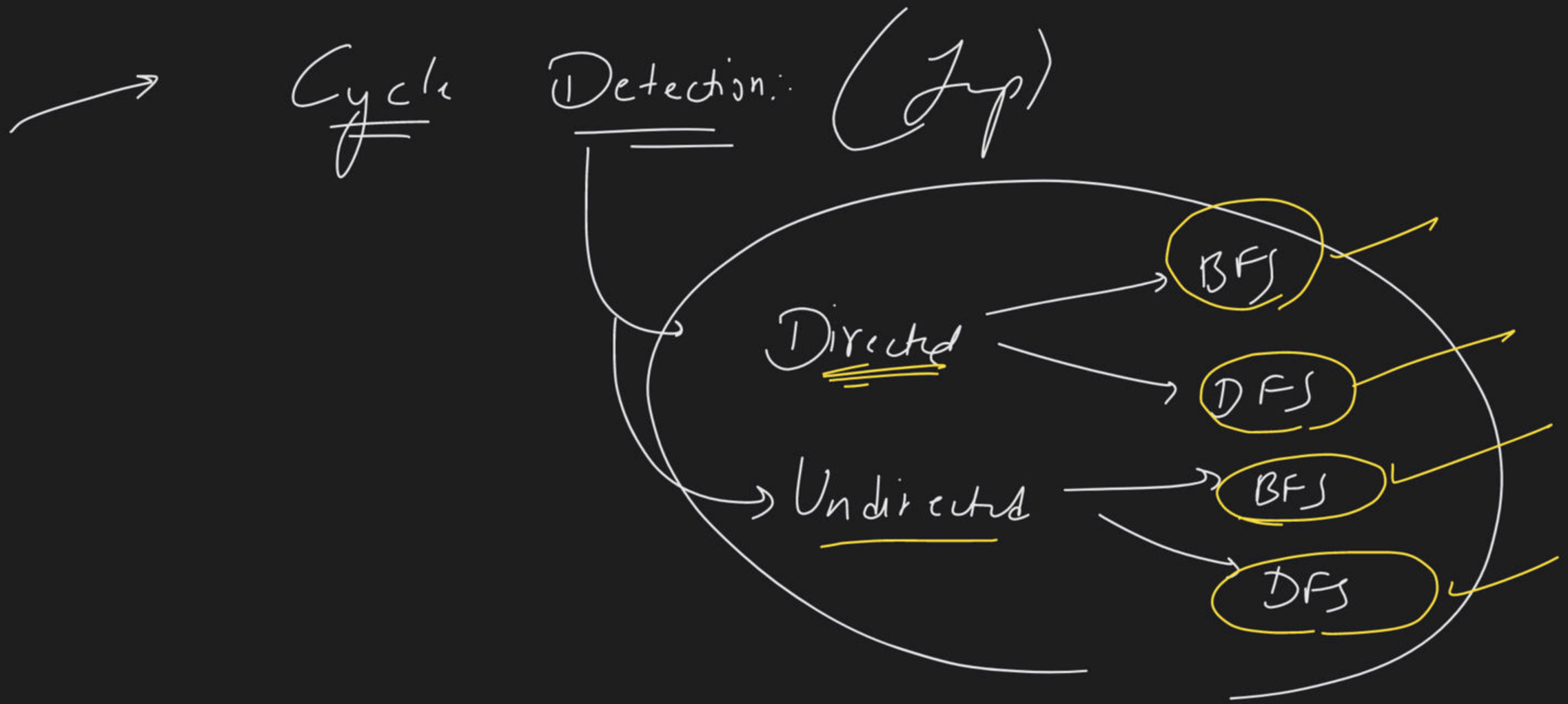
Graphs Class - 2

Special class



Love Babbar • June 18, 2023

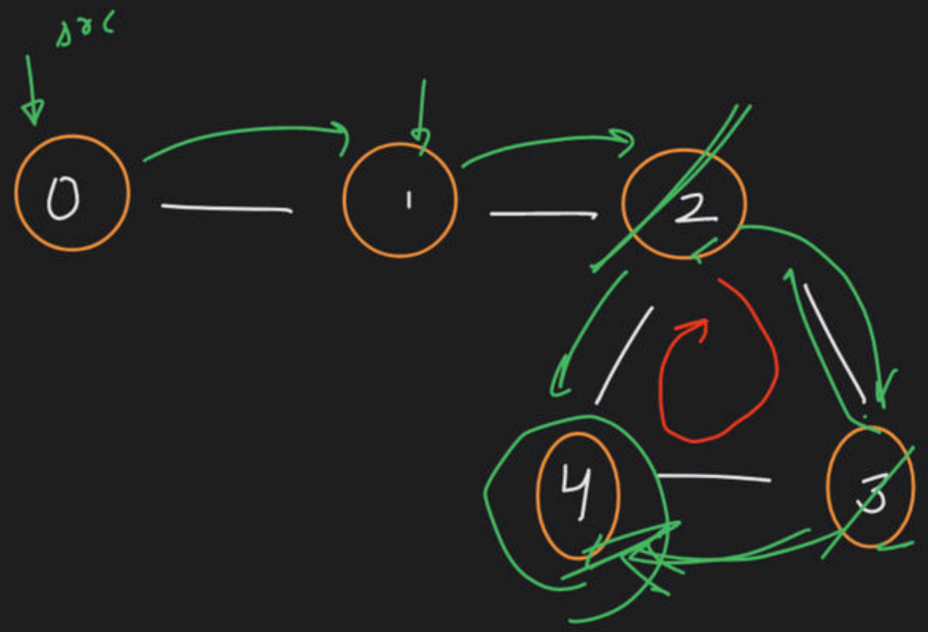
Cycle Detection: (Imp)



Undirected graphs:

- BFS
- DFS

Cycle → 2 - 3 - 4



guess

Visited

0 → True

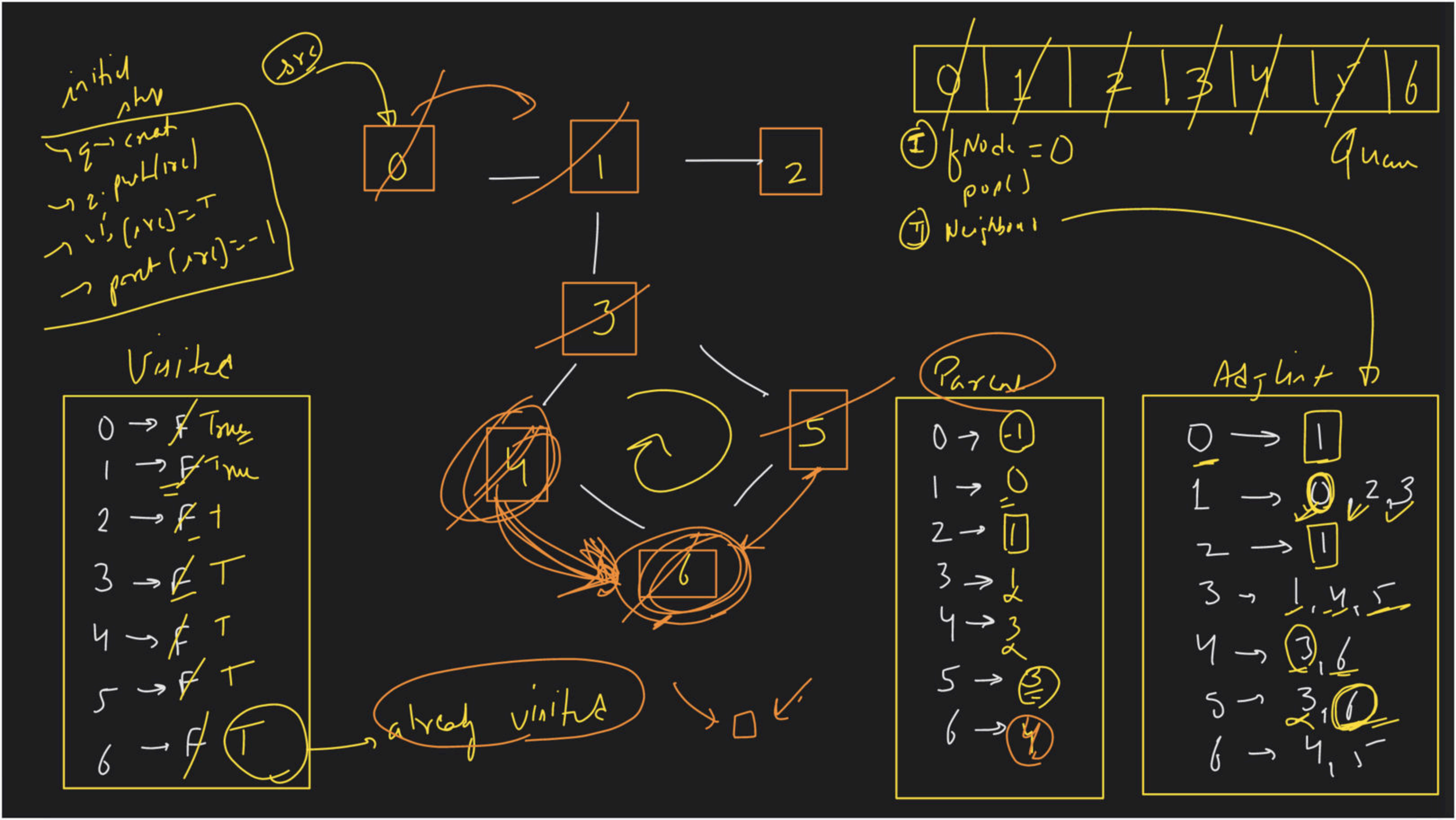
1 → True

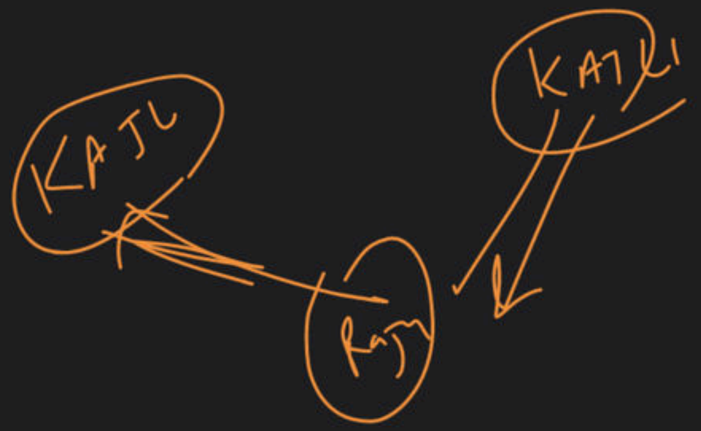
2 → T

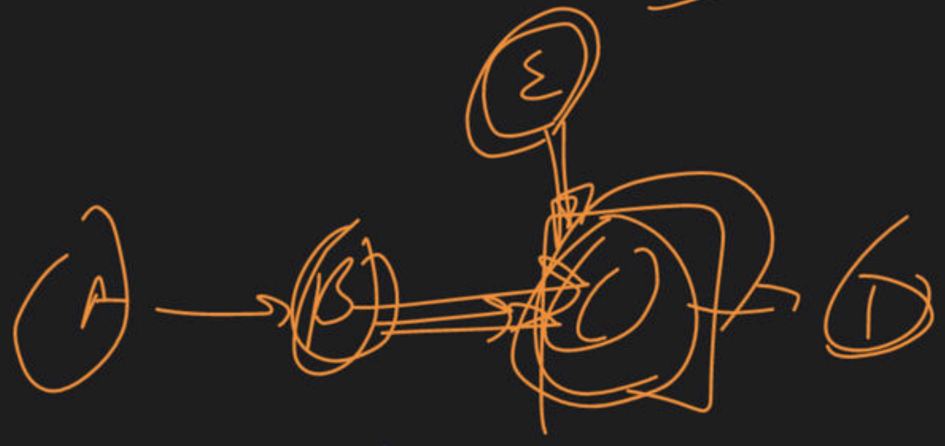
3 → T

4 → T

already visited & Not parent


initial step
q → create
→ q.push(src)
→ vi[src] = T
→ par[src] = -1
src
0
1
2
3
4
5
6
Visited
0 → F T
1 → F T
2 → F T
3 → F T
4 → F T
5 → F T
6 → F T
already visited
Parent
0 → -1
1 → 0
2 → 1
3 → 4
4 → 3
5 → 3
6 → 4
Adj List
0 → 1
1 → 0 2 3
2 → 1
3 → 1 4 5
4 → 3 6
5 → 3 6
6 → 4
0 1 2 3 4 5 6
Queue
I) f Node = 0
pop()
II) Neighbours



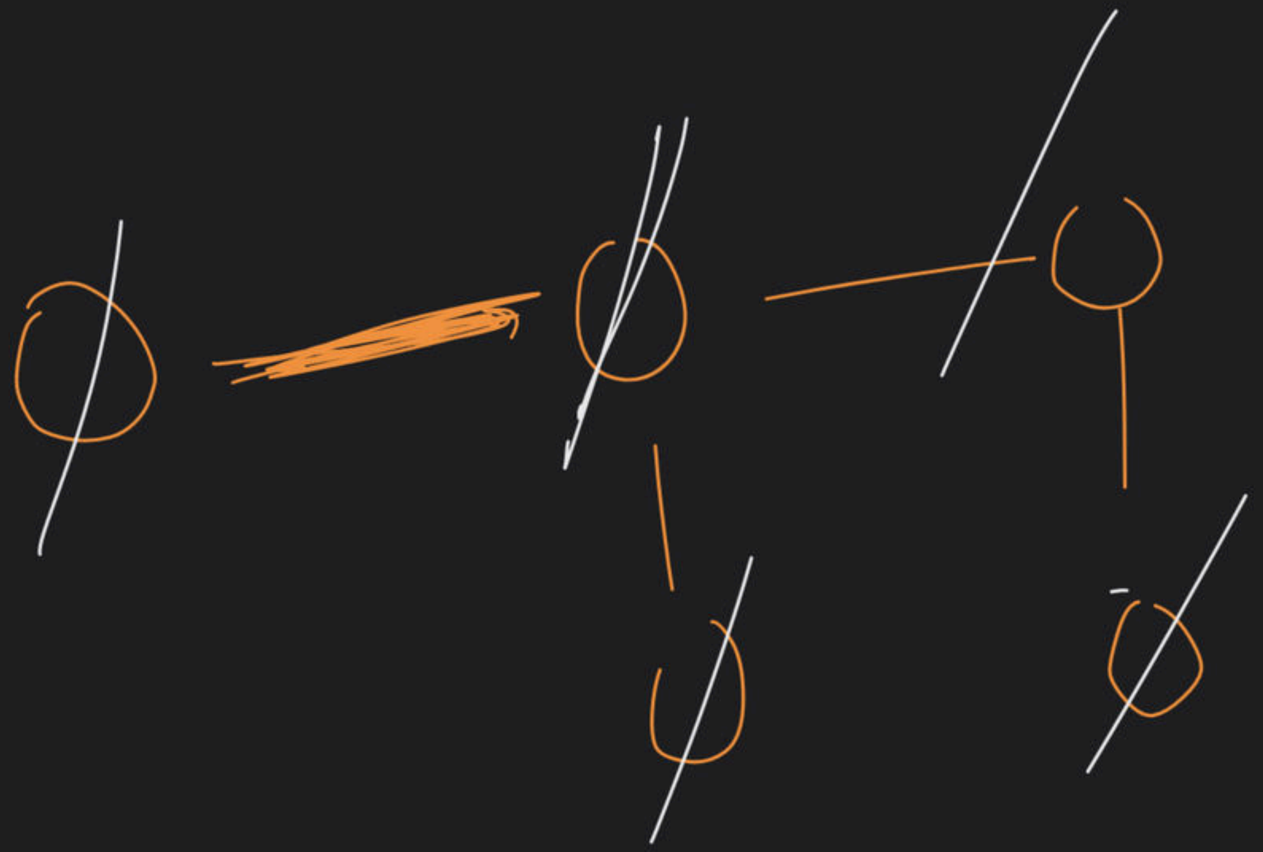


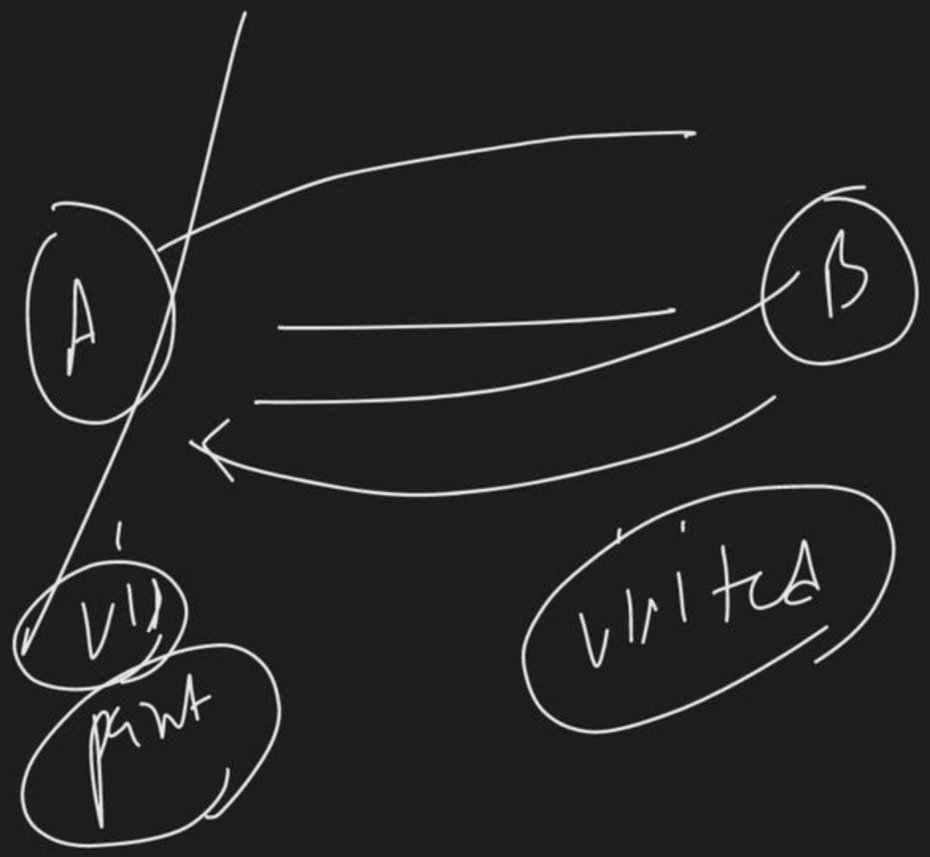
parent [B] = A

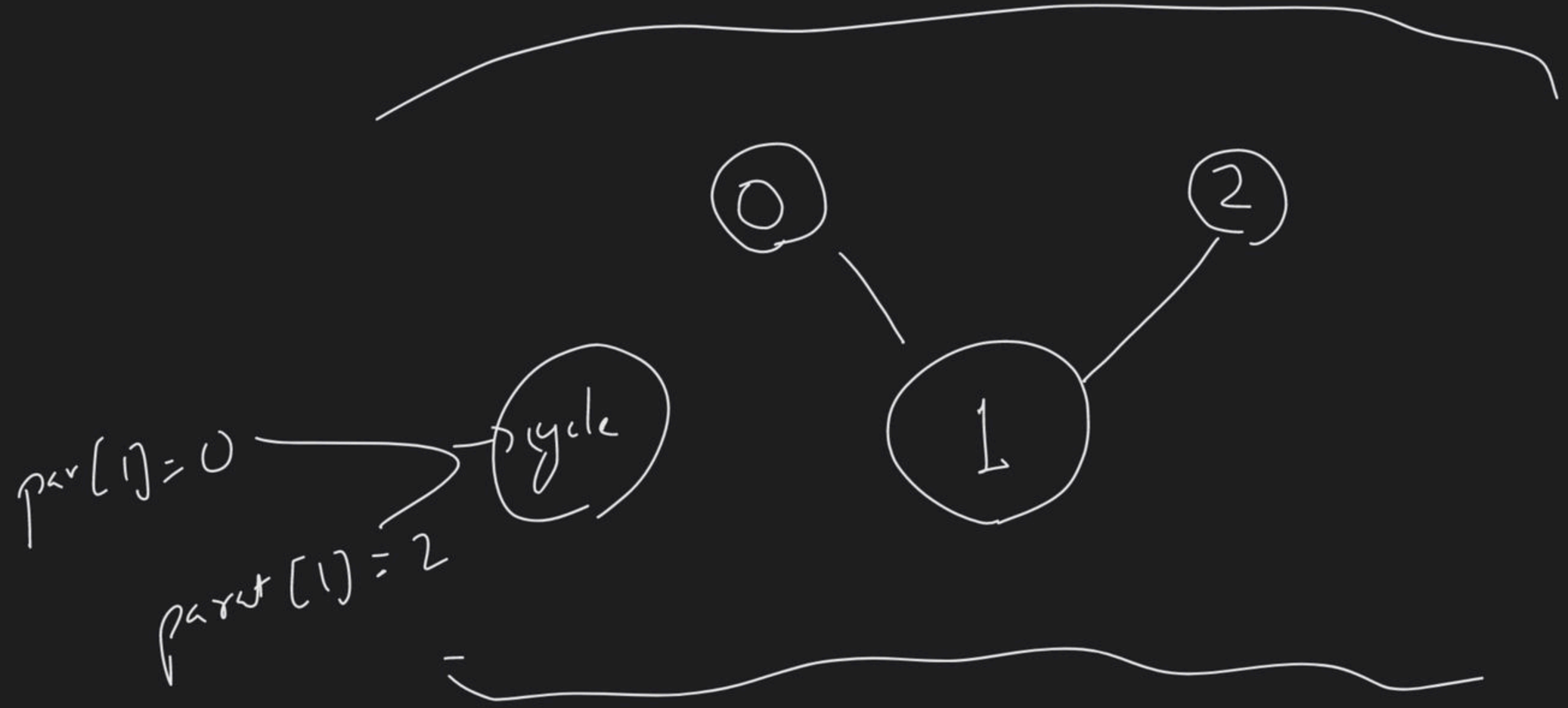
parent [C] = B

parent [D] = C

B → parent → A




A
B

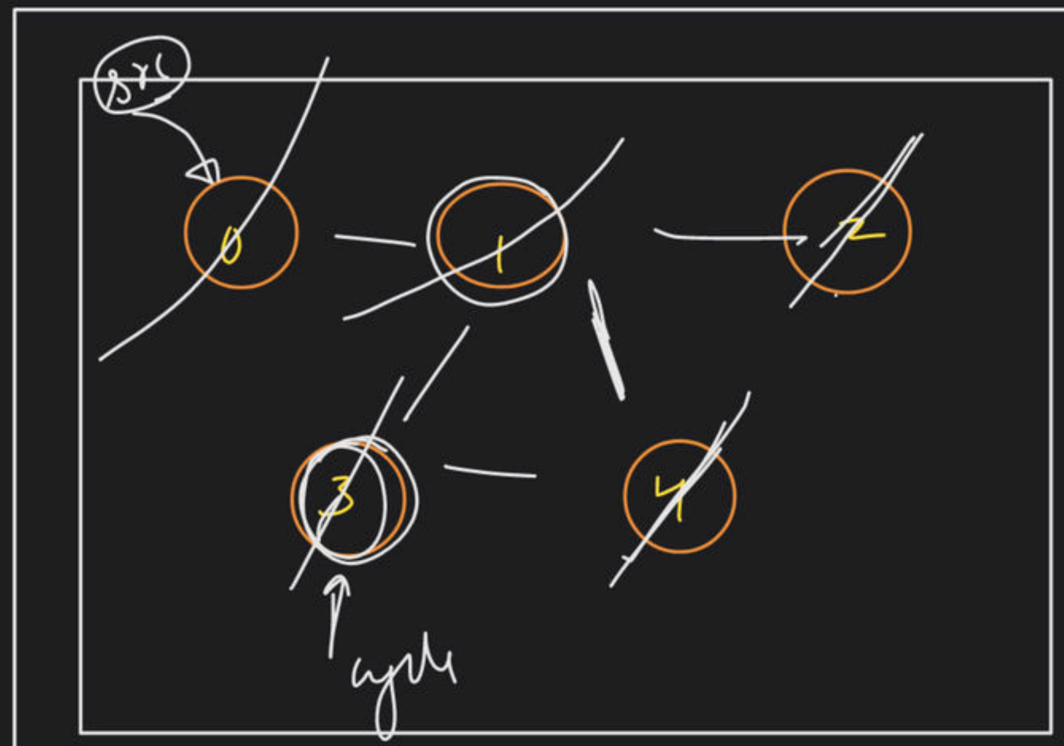

0
2
par[1] = 0
cycle
1
parent[1] = 2

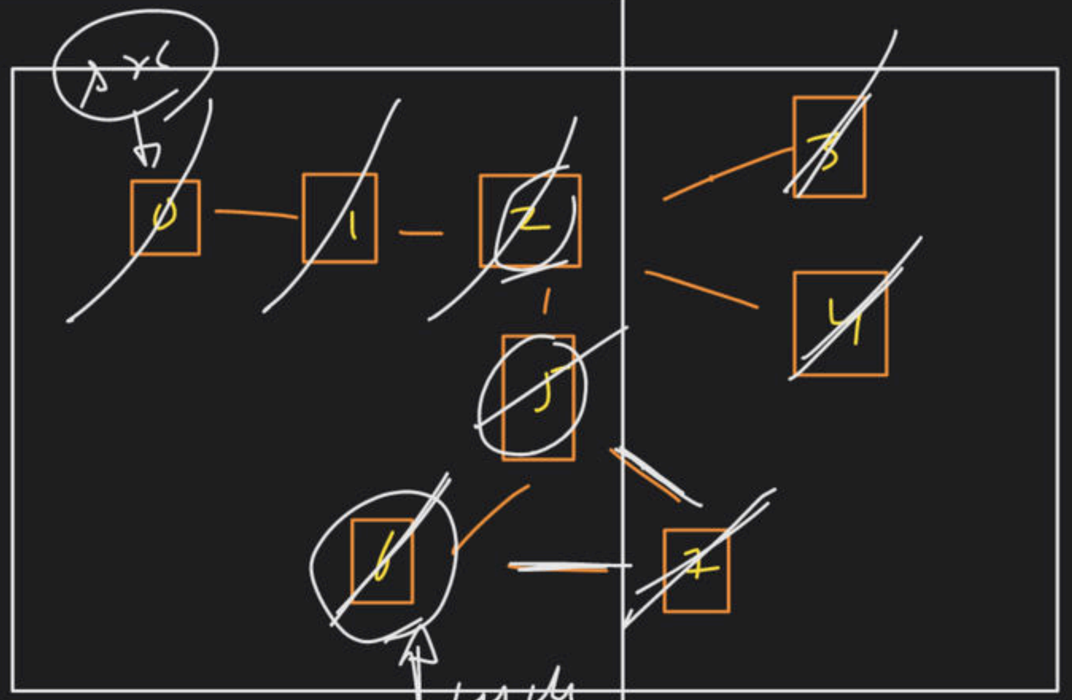
Cyclic

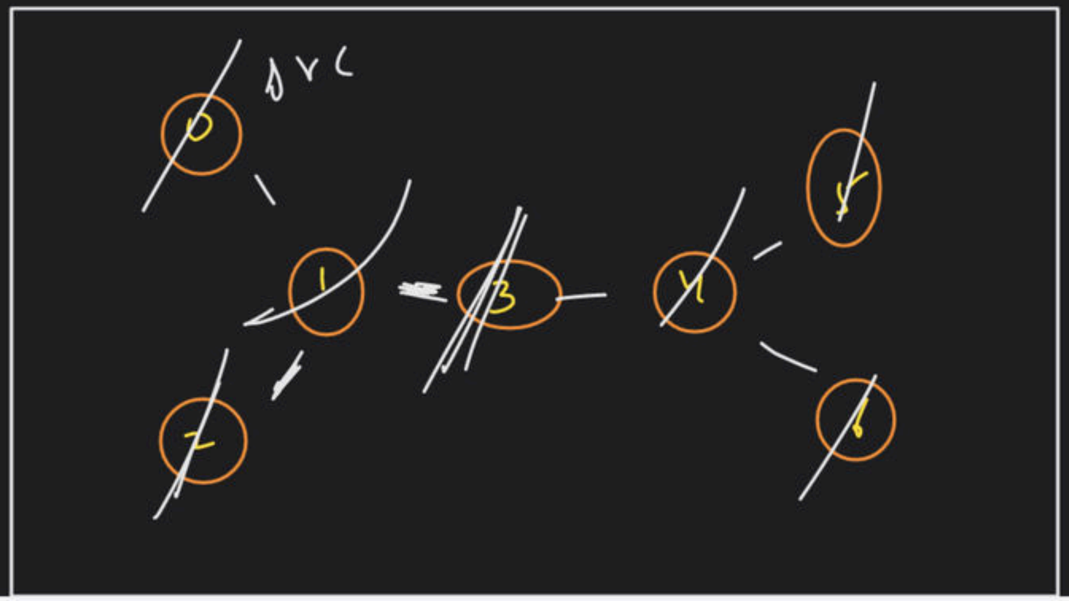
→ pohoch sktc
h from differ
point

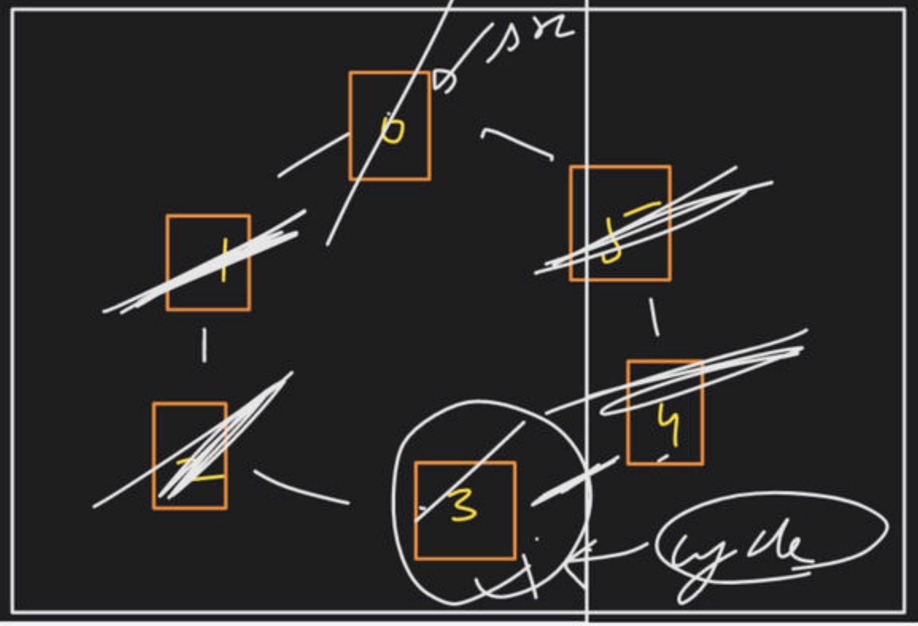
Non-cyclic

→ Single Node
↑
twin

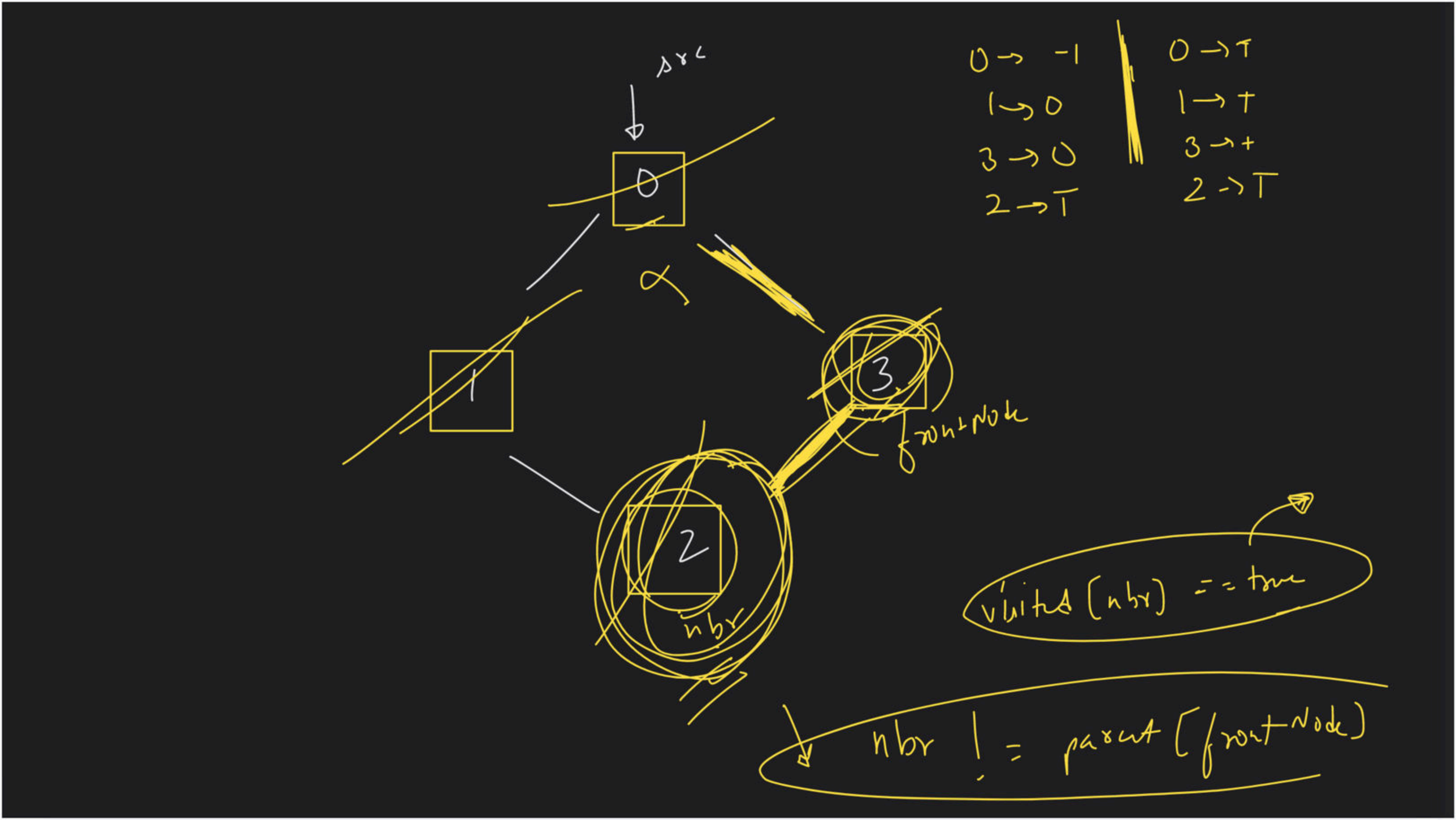

src
0
1
2
3
4
cycle

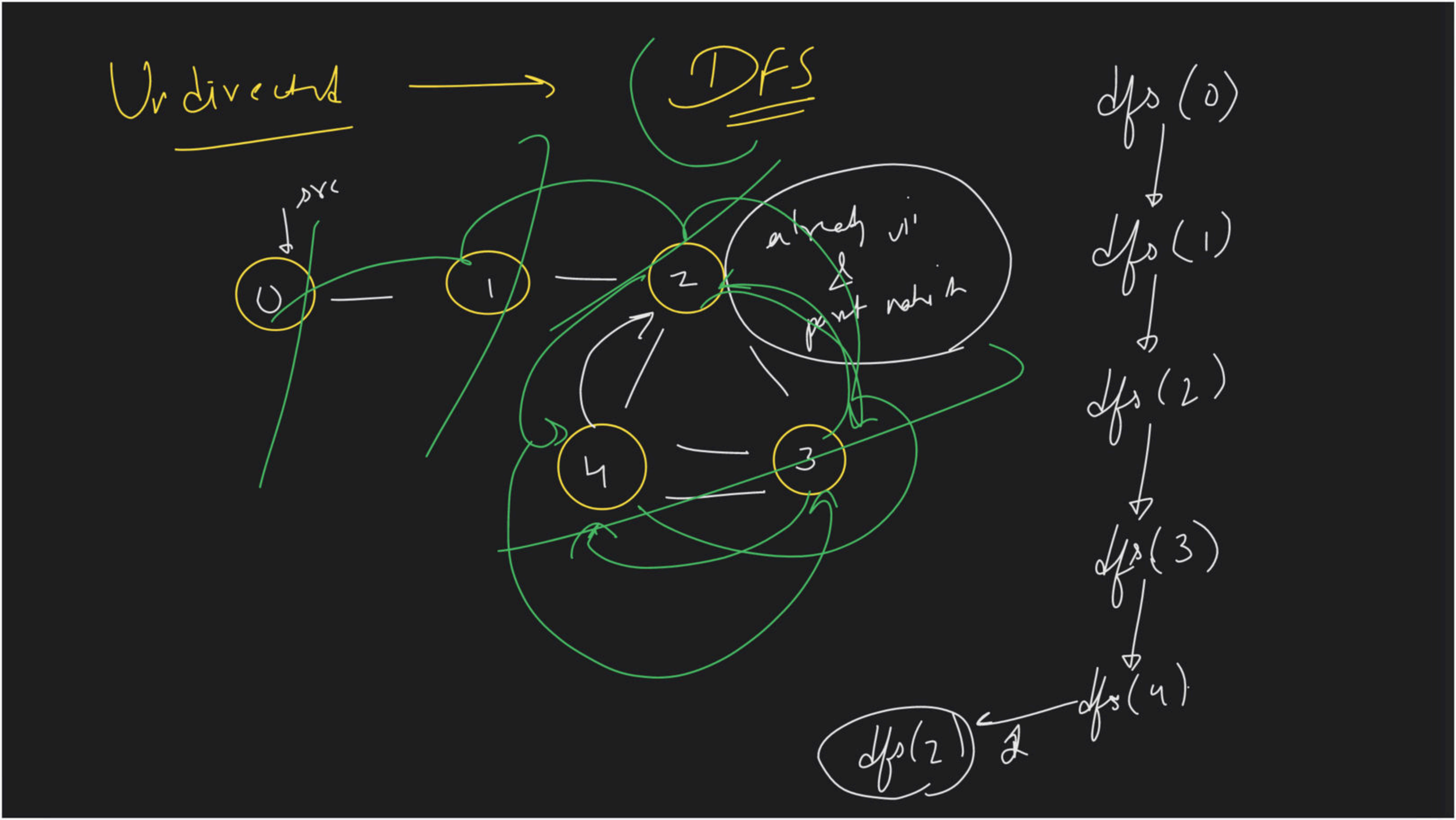

src
0
1
2
3
4
5
6
7
cycle

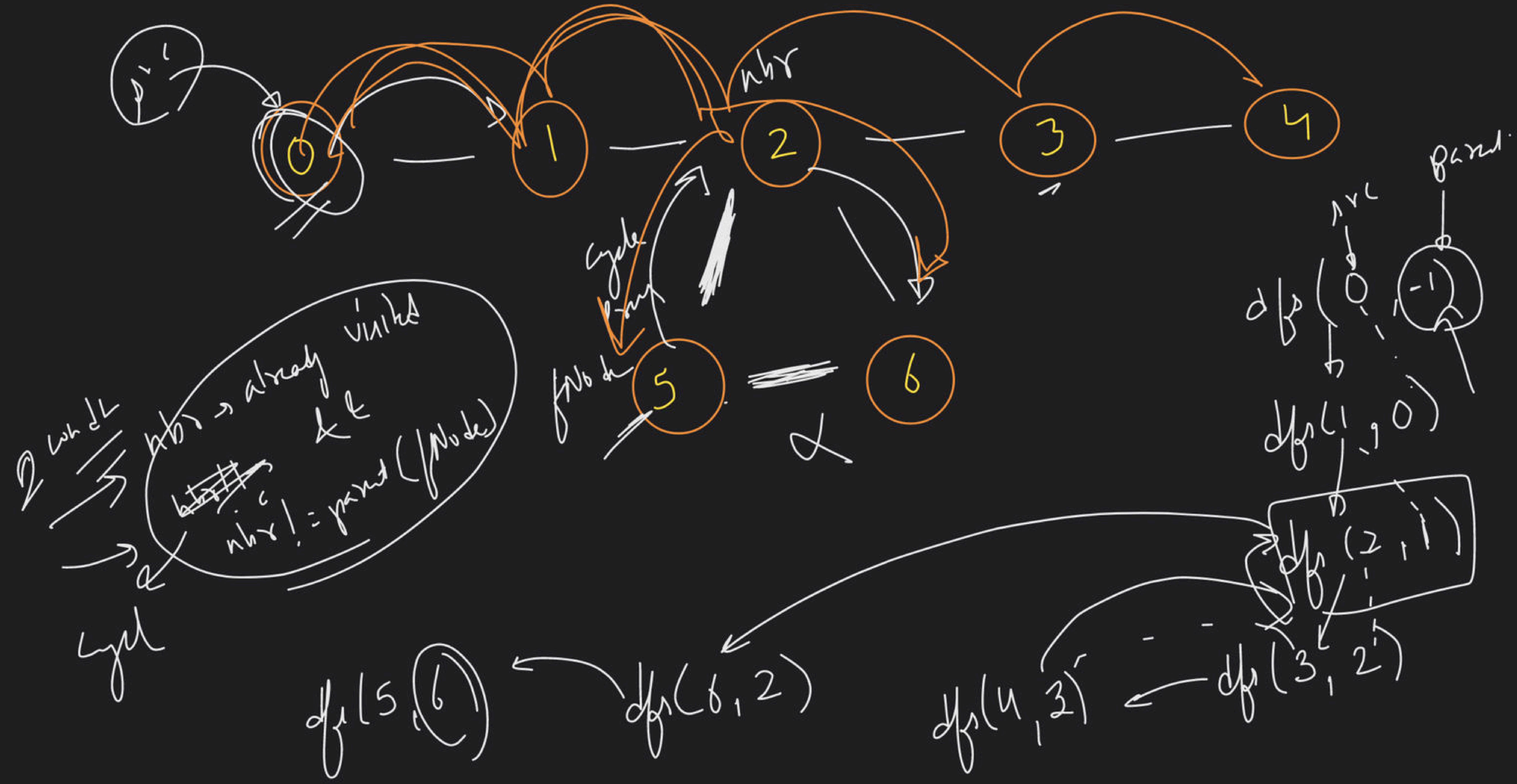

src
0
1
2
3
4
5
6


src
0
1
2
3
4
5
cycle

parent

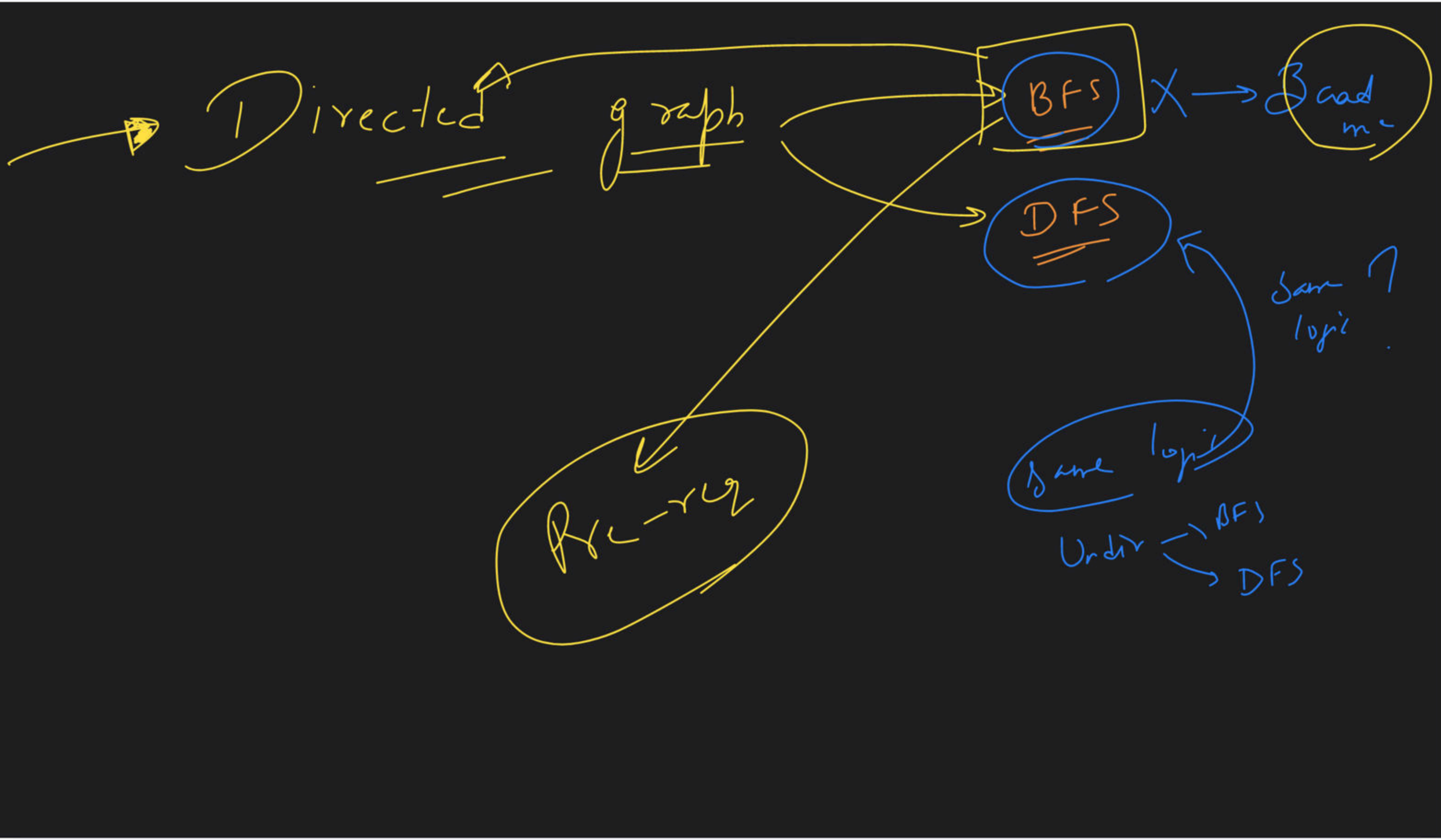

src
0
1
2
3
q
frontNode
nbr
0 → -1
1 → 0
3 → 0
2 → T
0 → T
1 → T
3 → T
2 → T
visited (nbr) == true
nbr != parent (frontNode)

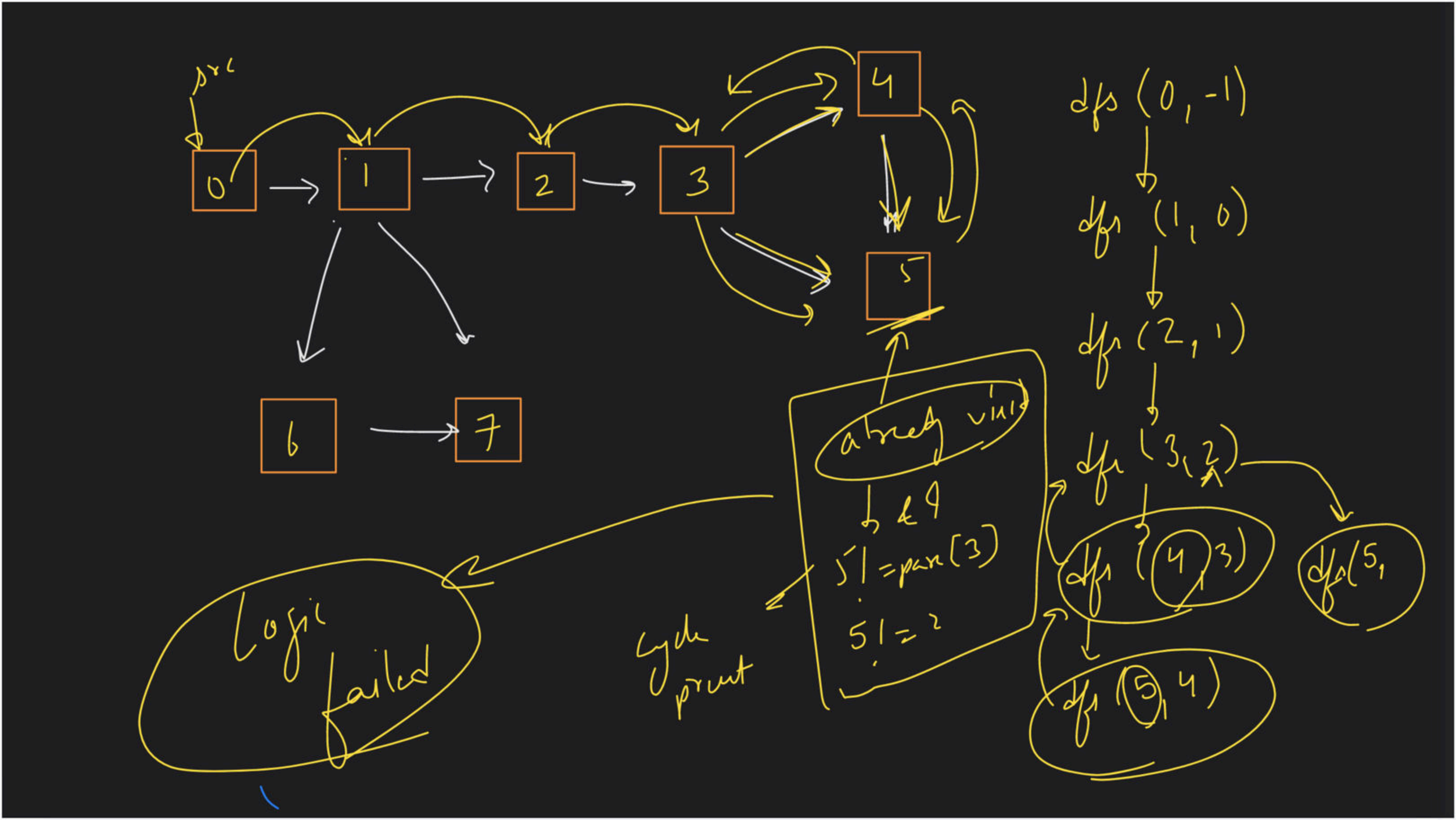

Undirected
DFS
src
0
1
2
3
4
already visited
parent node
dfs(0)
dfs(1)
dfs(2)
dfs(3)
dfs(4)
dfs(2)
2

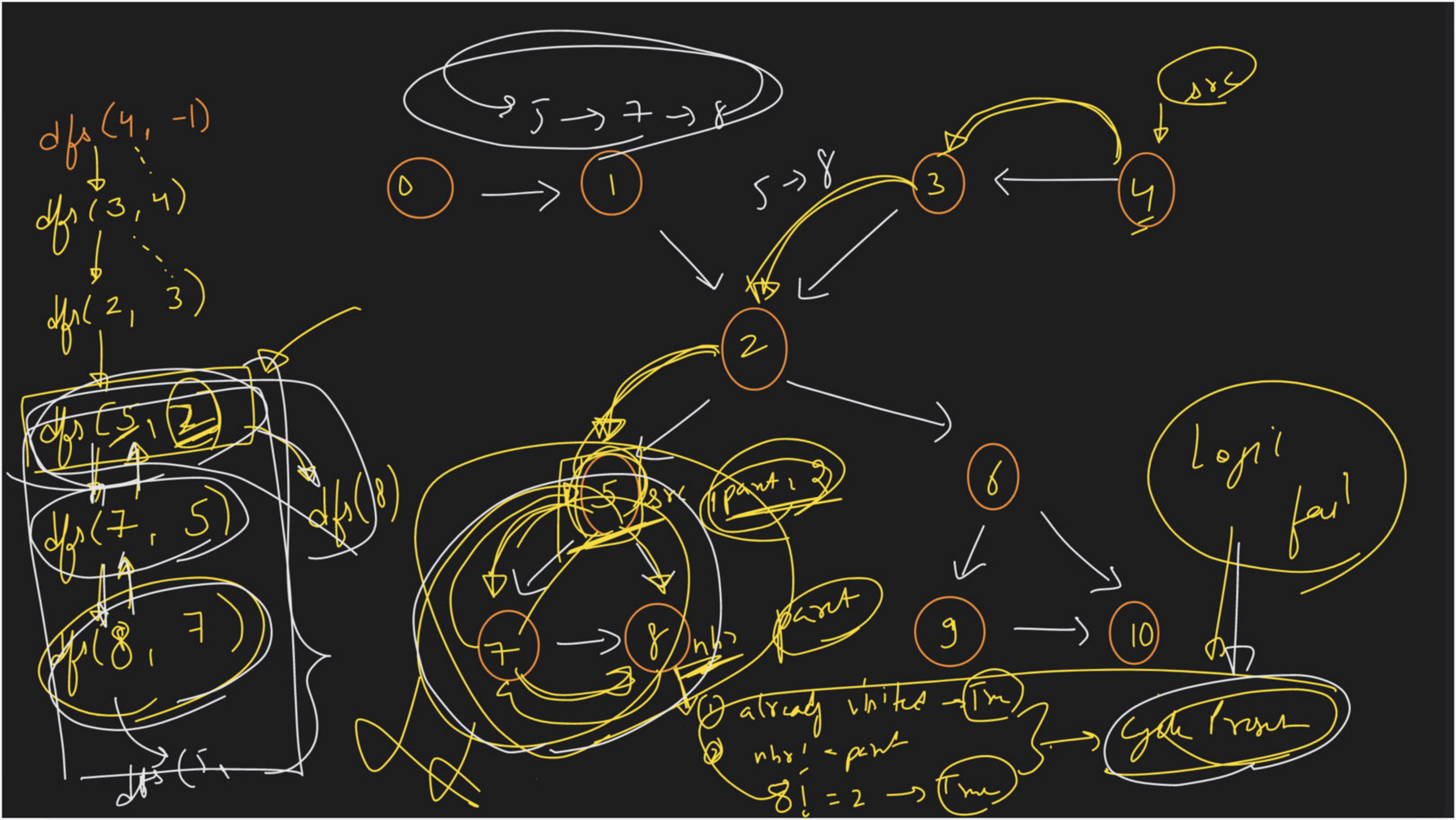


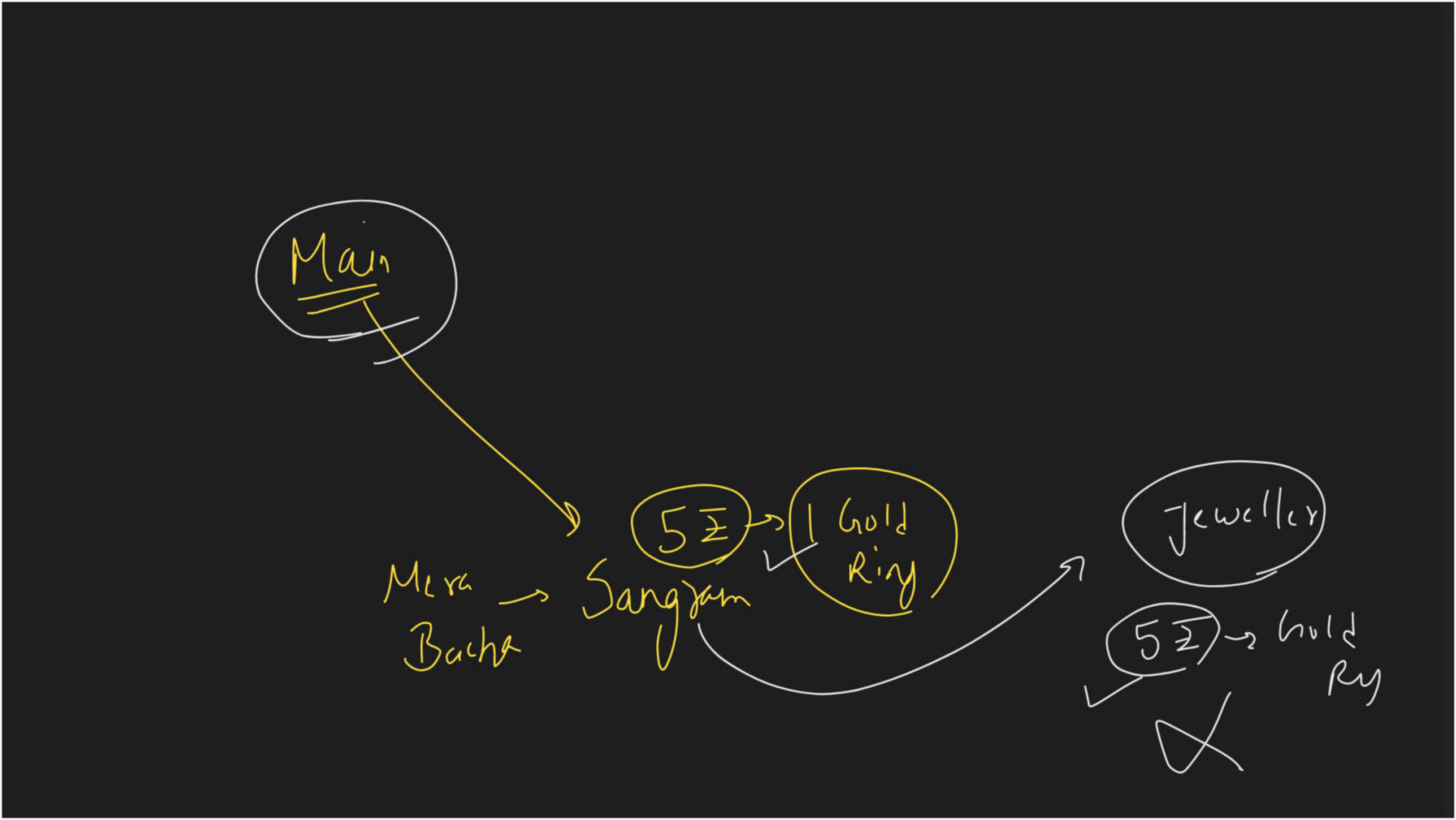
src
nbr
parent
0
1
2
3
4
5
6
cycle
dfs(0, -1)
dfs(1, 0)
dfs(2, 1)
dfs(3, 2)
dfs(4, 3)
dfs(6, 2)
dfs(5, 6)
nbr → already visited
&&
nbr != parent

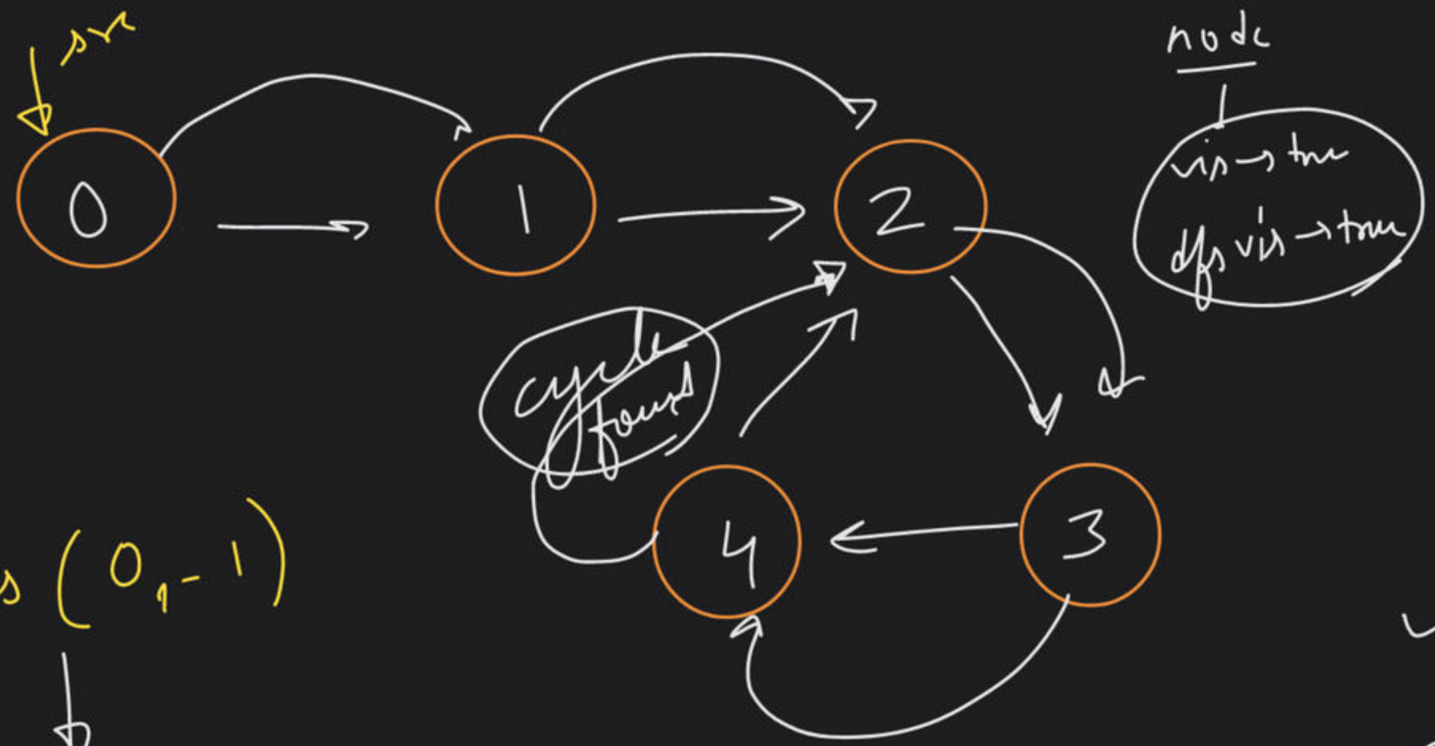
→ Undirected graph → Cycle detection


Directed graph
BFS
DFS
Same logic ?
Same logic
Undir → BFS
→ DFS


src
0
1
2
3
4
5
6
7
dfs (0, -1)
dfs (1, 0)
dfs (2, 1)
dfs (3, 2)
already visited
& 9
5! = par(3)
5! = 2
cycle present
Logic failed
dfs (4, 3)
dfs (5,
dfs (5, 4)


dfs(4, -1)
dfs(3, 4)
dfs(2, 3)
dfs(5, 2)
dfs(7, 5)
dfs(8, 7)
dfs(8)
5 → 7 → 8
0
1
3
4
src
2
6
7
8
9
10
parent
Logic fail
already visited → True
nbr != parent
s != 2 → True
Cycle Present


Main
Mera Bacha
Sangram
5₹
1 Gold Ring
Jeweller
5₹
Gold Ry



node
vis → true
dfsvis → true

Adj list

0 → 1
1 → 2
2 → 3
3 → 4
4 → 2

dfs (0, -1)
↓
dfs (1, 0)
↓
dfs (2, 1)
→ dfs (3, 2) → dfs (4, 3)

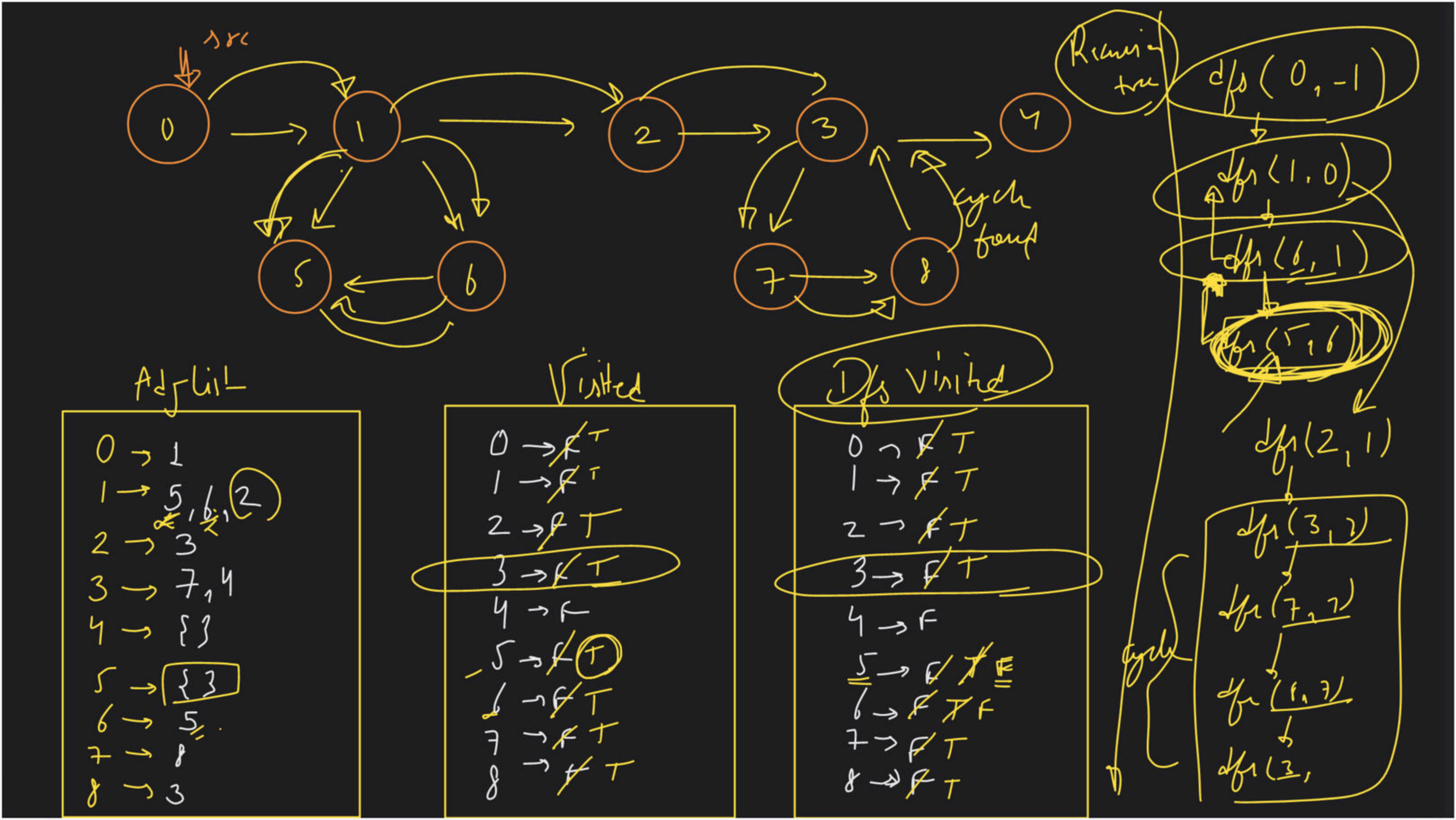
A → 0 → 0 → 0 → A

Visited

0 → F T
1 → F T
2 → F T
3 → F T
4 → F T

DfsVisited

0 → F T
1 → F T
2 → F T
3 → F T
4 → F T


src
0
1
2
3
4
5
6
7
8
cycle found
Recursion tree
dfs(0, -1)
dfs(1, 0)
dfs(5, 1)
dfs(6, 5)
dfs(2, 1)
dfs(3, 2)
dfs(7, 7)
dfs(8, 7)
dfs(3,
cycle
Adjlist
0 → 1
1 → 5, 6, 2
2 → 3
3 → 7, 4
4 → {}
5 → {3}
6 → 5
7 → 8
8 → 3
Visited
0 → F T
1 → F T
2 → F T
3 → F T
4 → F
5 → F T
6 → F T
7 → F T
8 → F T
Dfs Visited
0 → F T
1 → F T
2 → F T
3 → F T
4 → F
5 → F F F
6 → F F F
7 → F T
8 → F T