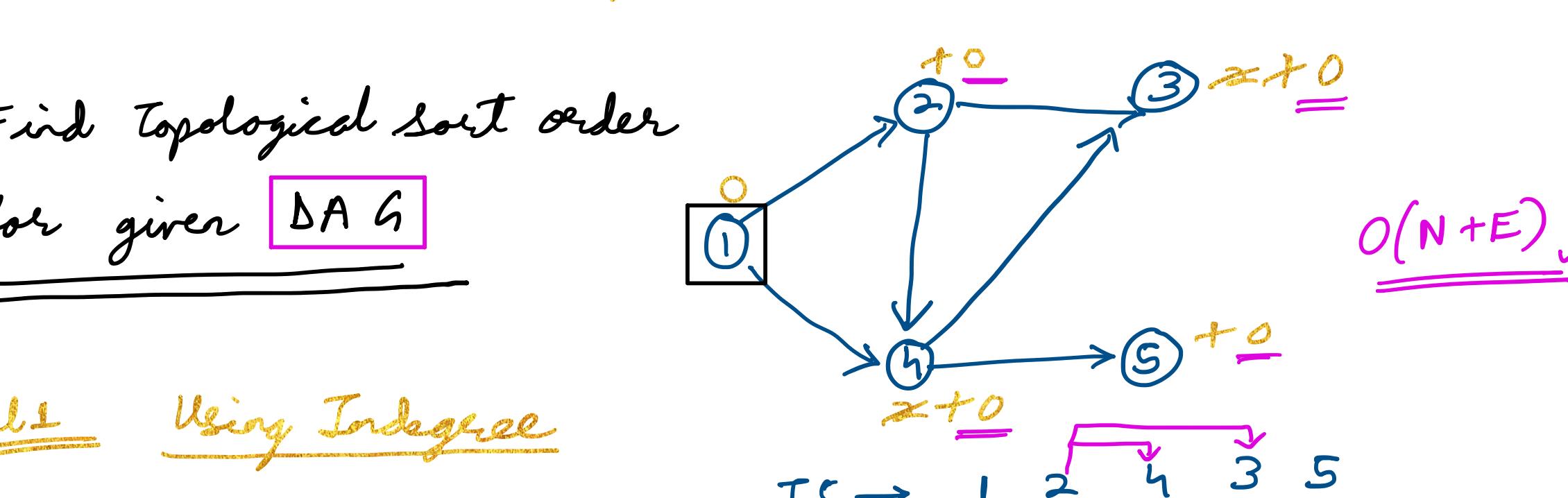
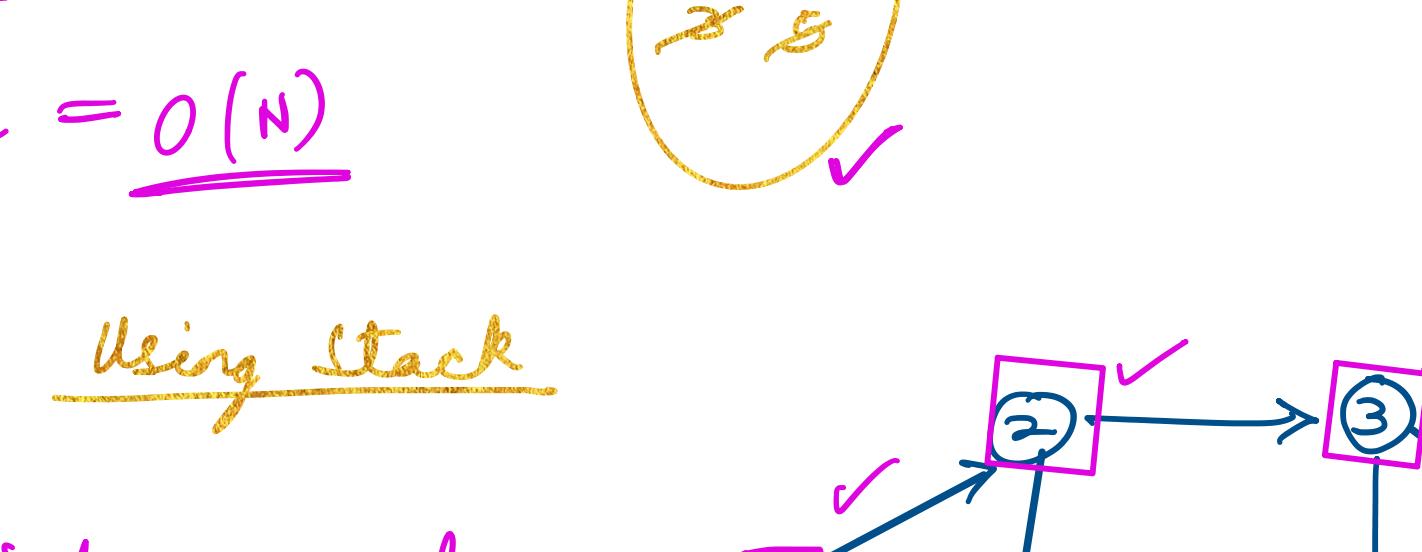


Topological Sort

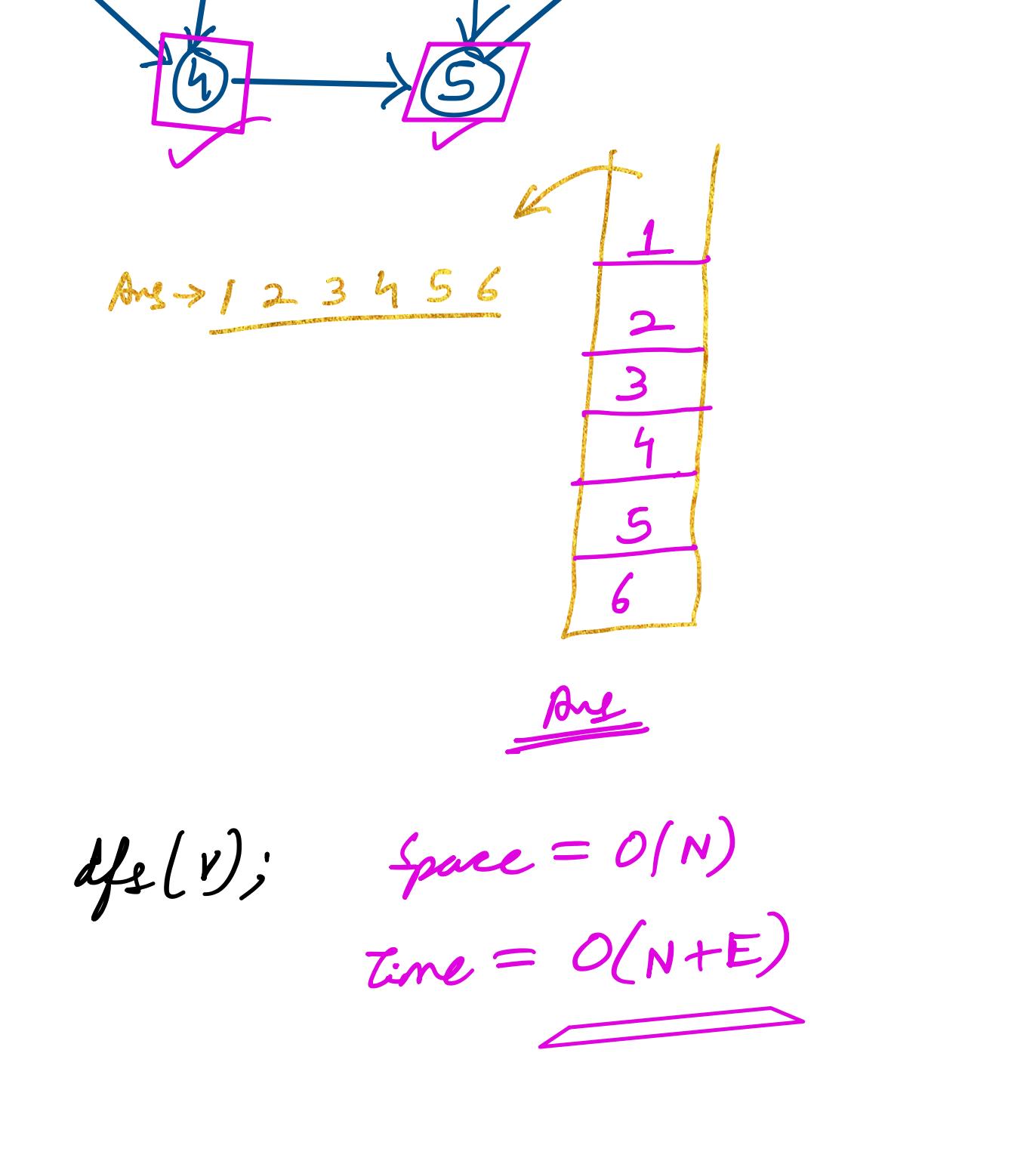
linear ordering of the nodes s.t if there is a path from node i to node j then i is on left side of j .



Topological sort is only possible for Directed Acyclic Graph.



Find Topological sort order for given DAG



Sol 1 Using Indegree

$$TS \rightarrow 1, 2, 4, 3, 5$$

$$\text{Time} = O(N+E)$$

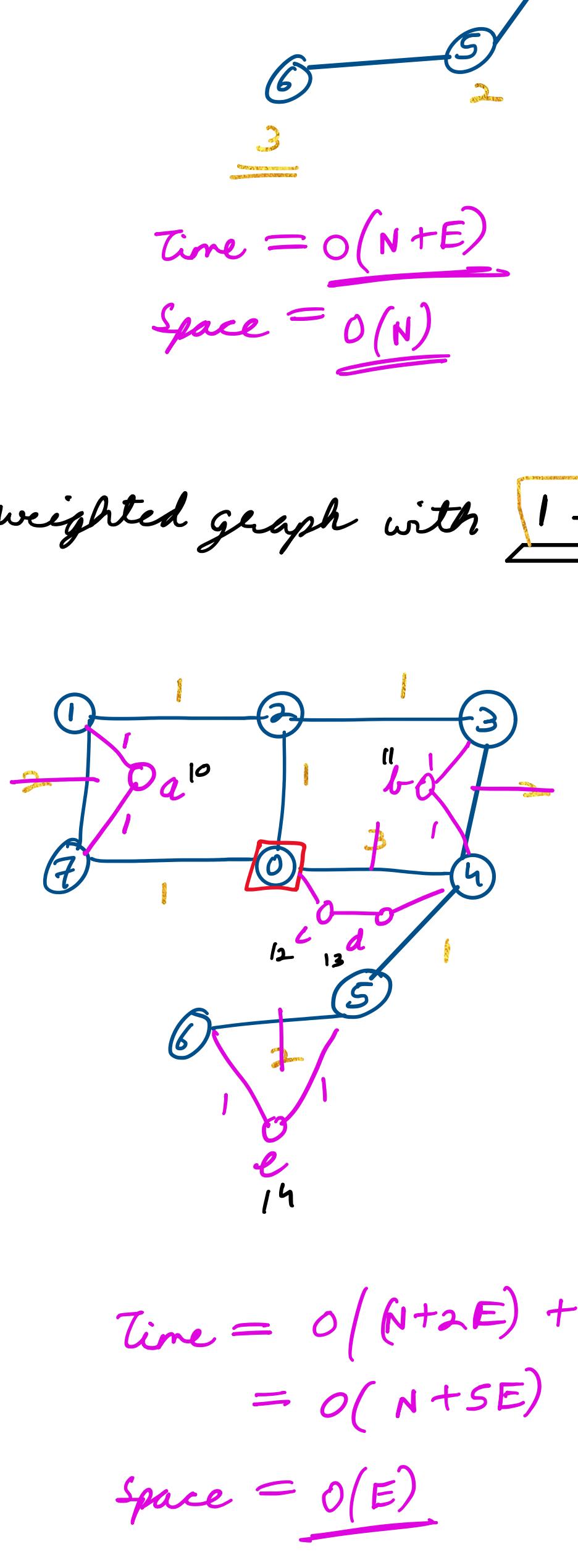
$$\text{Space} = O(N)$$

Sol 2 Using Stack

Run DFS from any node.

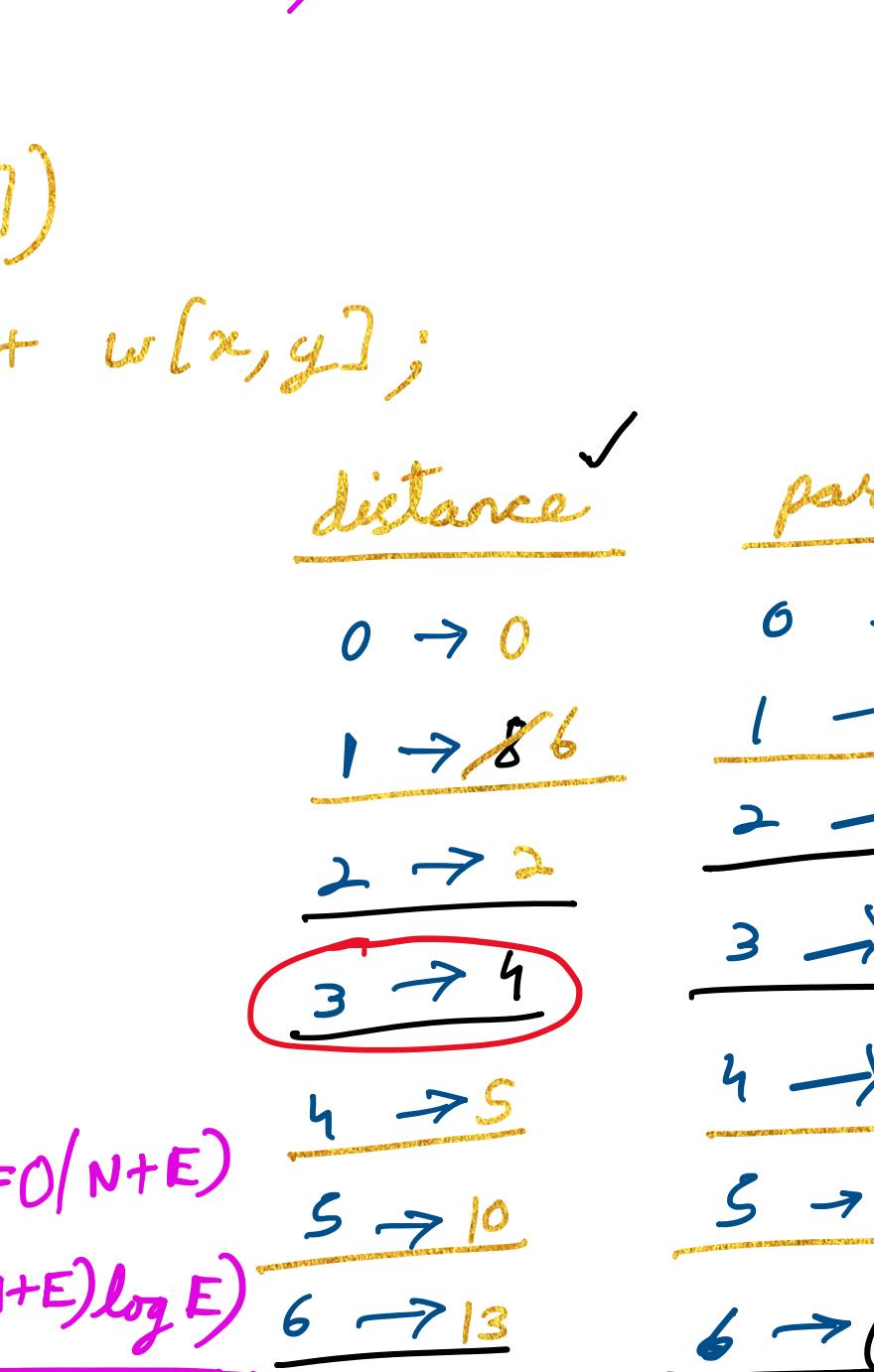
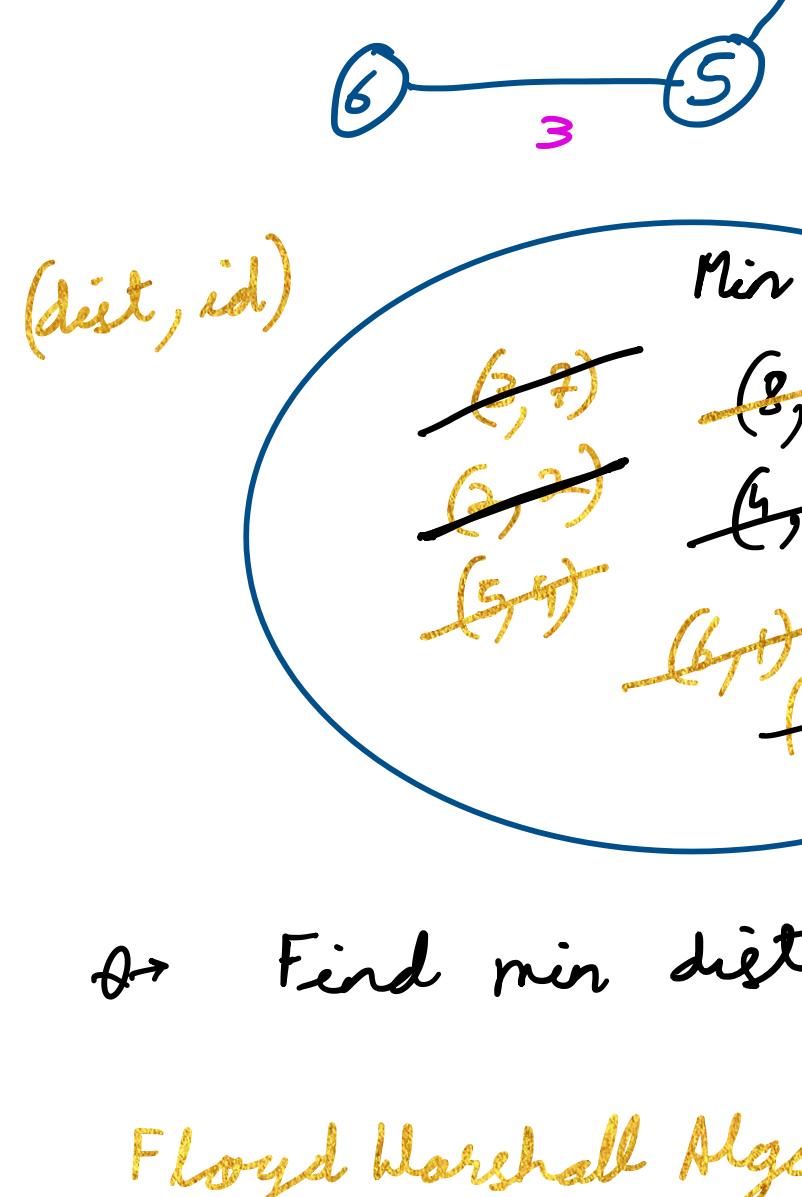
```

vet[1] = {0}
for(i = 0; i < n; i++) {
    if(!vet[i])
        dfs(i);
}
void dfs(v) {
    vet[v] = 1;
    for(v : adj[v]) {
        if(!vet[v])
            dfs(v);
    }
    ans.push(v);
}
  
```

Distance Based Algo

Given an undirected graph find min no. of edges to travel from v to reach v .

$$v = 0 \quad Ans = 3$$

Unique path in tree

$$\text{Time} = O(N+E)$$

$$\text{Space} = O(N)$$

Same question \rightarrow Now weighted graph with $1 \leq w[i] \leq 3$

Source = 0

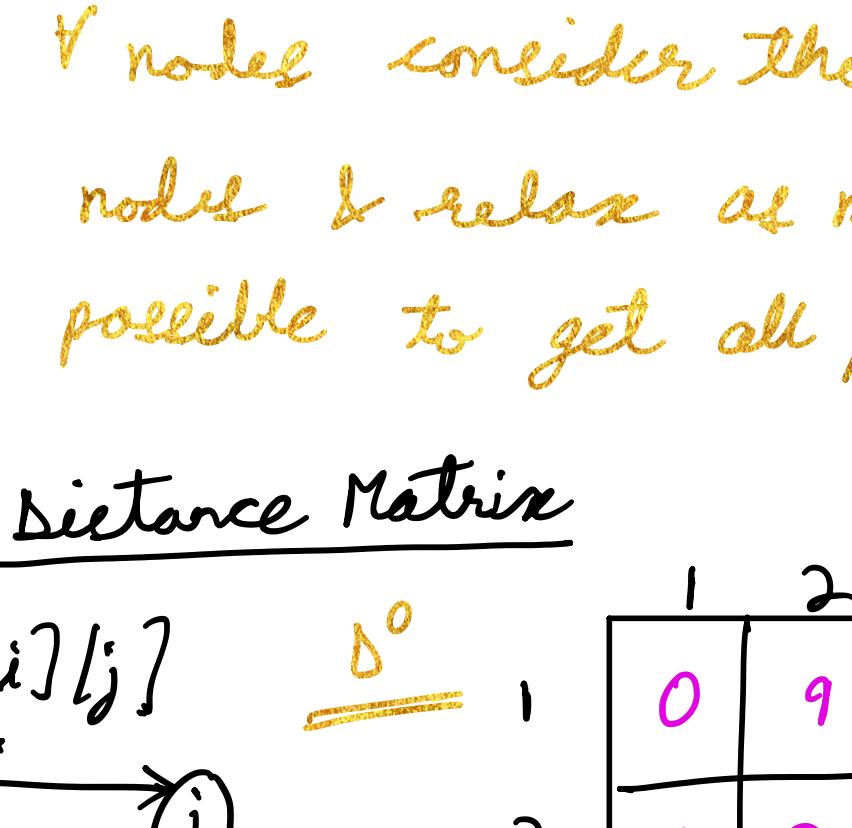
Find min distance to reach all nodes.

(dummy Nodes)

BFS from source

Ans 0

1
2
3
4
5
6



$$\text{Time} = O(N+2E) + 2E$$

$$= O(N+SE) = O(N+E)$$

$$\text{Space} = O(E)$$

Same question \rightarrow Now weighted graph with $1 \leq w[i] \leq 3$

Source = 0

Find min distance to reach all nodes.

(dummy Nodes)

BFS from source

Ans 0

1
2
3
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6

(dist, id)

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