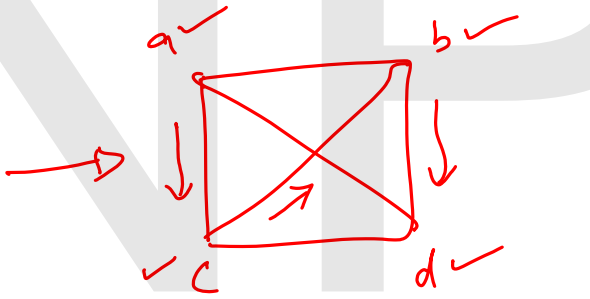
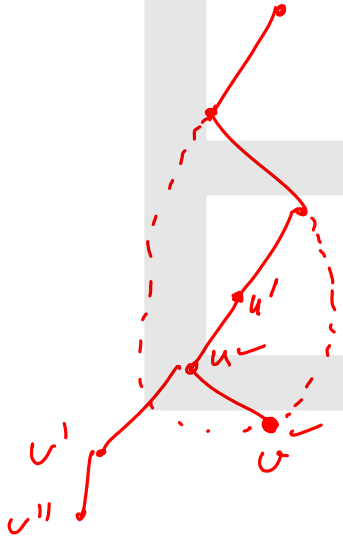
DFS. (Depth First Search).

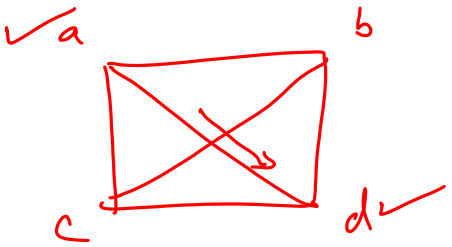
Note Title 17-05-2024

* Systematic exploration of a graph.
* Undirected graphs.
* Directed graphs.



Unvisited,
visited.





DFS (G, u) → Mark u visited.

→ For each $v \in Adj(u)$

if v is NOT visited

DFS (G, v).

(u, v) — Tree edges.

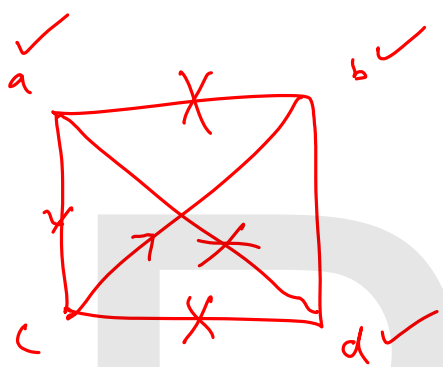
↓ visited

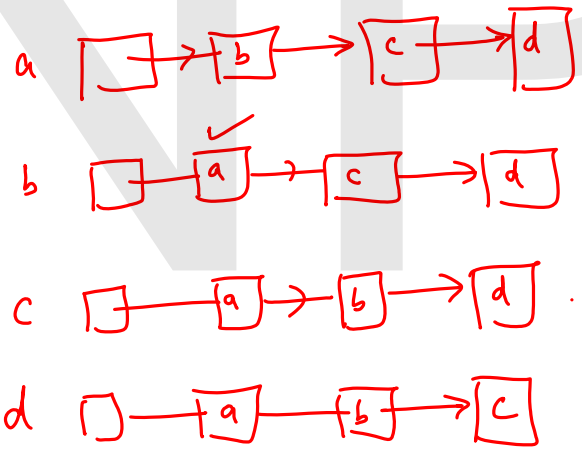
→ Not visited.

(u, v) — NON Tree edge.

↓ visited

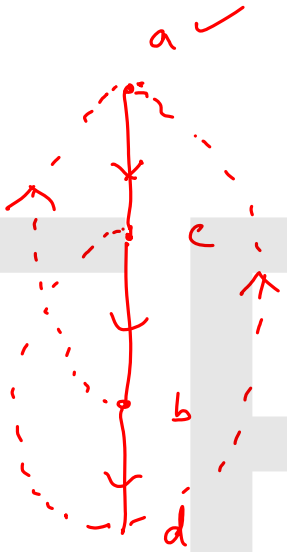
↘ visited.





(visited to unvisited)

DFS Tree

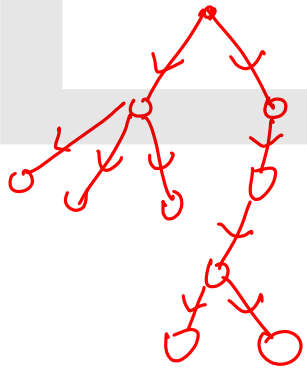


(visited, unvisited)

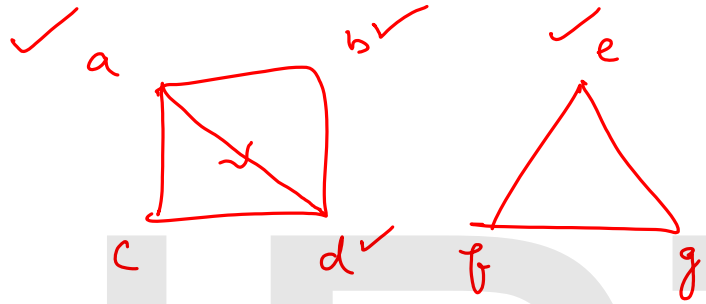
↓

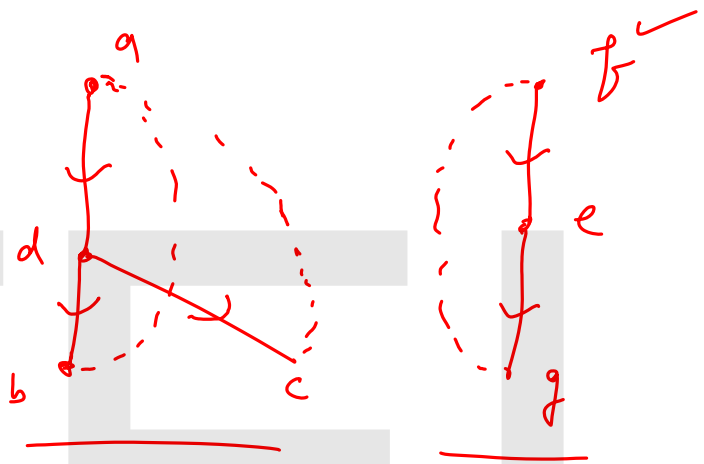
Tree edges.

Non Tree edges (back edges) ??



OUT Tree.





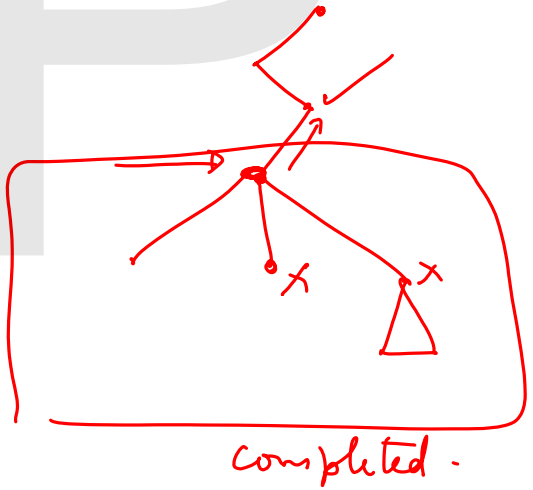
DFS ⟶ Single Tree — DFS Tree
if G is connected.

⟶ several Trees — DFS forest.
if G is disconnected & has several components.

① Mark all $v \in V$ as unvisited.

② For each $v \in V$ that is unvisited.

DFS(G, v).



completed.

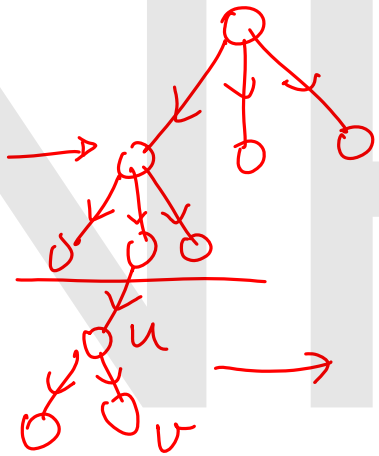
NOT visited.

visited & live.

completed the visit.

v

$v.color$ — White — NOT visited.
Gray — visited & live.
Black — completed the visit & left for its parent.



v is a child of u

u is the parent of v.

$p(v) = u$ $\Leftrightarrow$ $v.p = u$

$(v.p, v)$ → Tree edge ending at v.