Depth First Search

Depth-First Search (from CLRS text)

```
DFS(G)
1  for each vertex u in V
2     u.color = WHITE
3     u.prev = nil
4  time = 0
5  for each vertex u in V
6     if u.color = WHITE
7        DFS-Visit(G,u)
```

white - not seen yet
gray - in process
black - done

```
DFS-VISIT(G,u)
1  time = time + 1
2  u.disc = time
3  u.color = GRAY
4  for each v in adjacency list of u
5     if v.color = WHITE
6        v.prev = u
7        DFS-Visit(G,v)
8  u.color = BLACK
9  time = time +1
10 u.finish = time
```

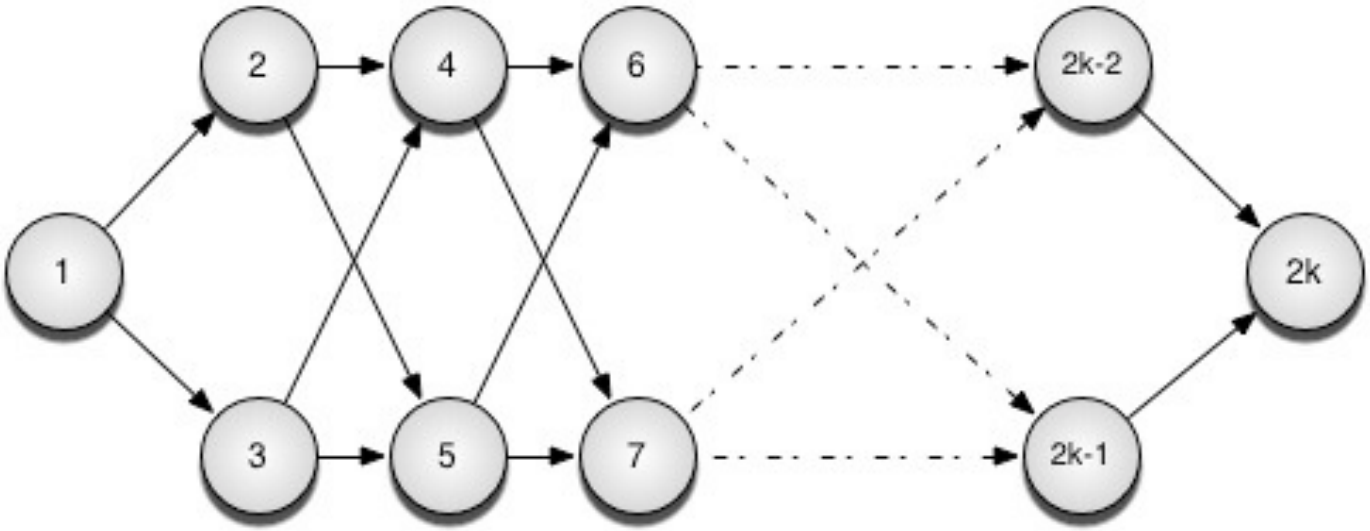
edge classification

- tree edges - used in a DFS tree
- back edges - to an ancestor in DFS tree
- forward edges - to a descendent
- cross edges - all othe edges

topological sort

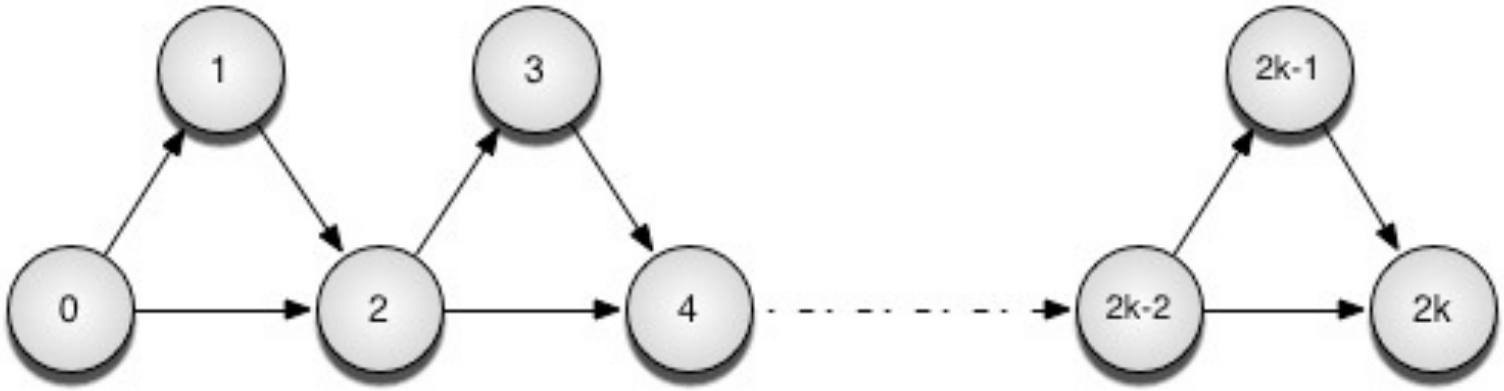
- DAG = directed acyclic graph
- no back edges
- reverse finish time

dag with many paths



with V=2k, this graph has 2^{k-1} paths from 1 to 2k
(that is, exponentially many paths)

dag with many paths (2)



here V=2k+1, and there are 2^k paths from 0 to 2k