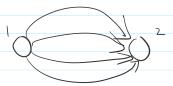
## Lecture 10 Graph Algorithms I Depth First Search

## - vertices and edges

- n: # of vertices

m: # of edges

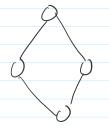


often: in a graph, the same edge only appears or most once

in this case  $m \leq n^3$ 

vertices in a graph are connected

in this case m≥n-1



- representing graphs

- adjacency array

O(n2) space, can check (i,j) is an edge O(1)

enumerate edges adjacent to a vertex ()(n)

better for dense grephs when m = () (n2)

- adjacency list

O(n+m), check if (i,j) is an edge O(degree(i))

enumerate edges adjacent to i (degree(i))

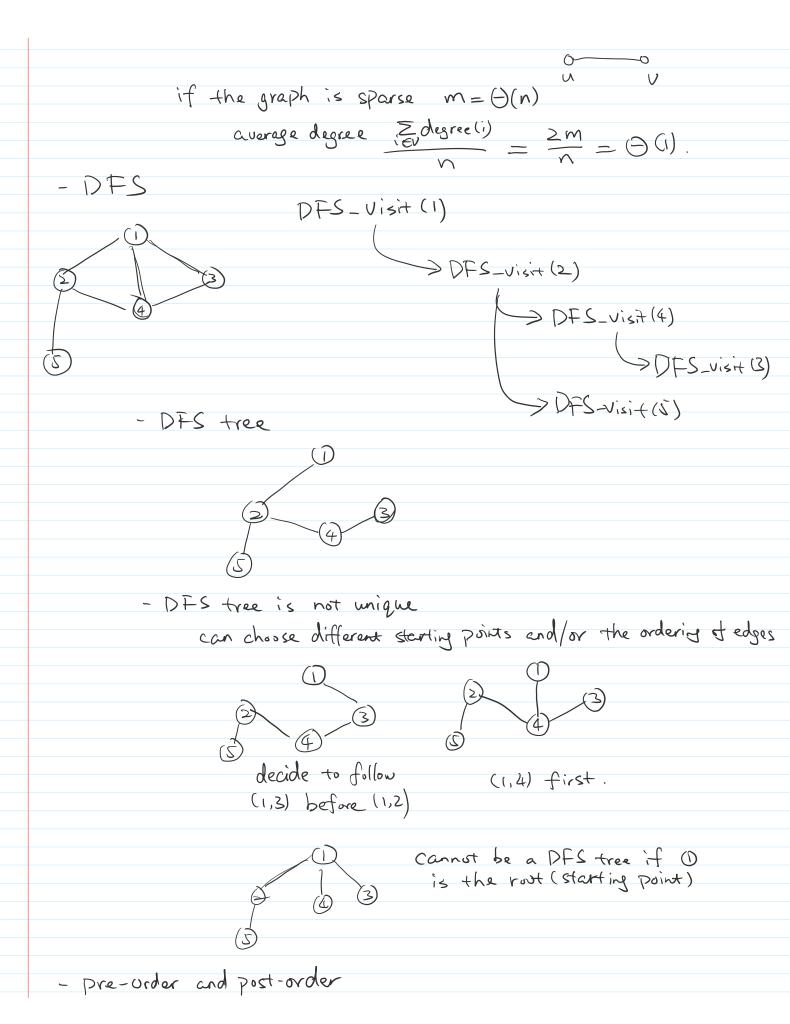
- Def: degree of a vertex degree(i) is the number of edges

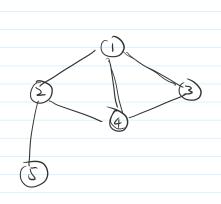
that is adjacent to i.

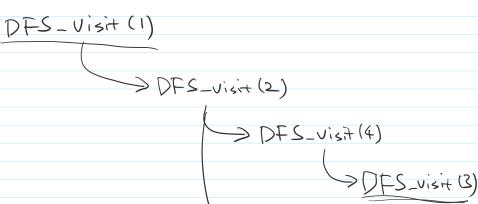
(directed) in-degree of a vertex in-degli) is # incoming edges out-degree of a vertex out-deg (i) is # outgoing edges

- Claim: for an undirected graph, Z degree (i) = 2m #edges.  $i \in V$ 









- pre-order: (D 2 43 6
- post-order 3 4 0 0 0
- Pre-order: ordering that draw the vertices.
- Post-order: ordering in which the subtrees are finished

