Graphs

Objectives

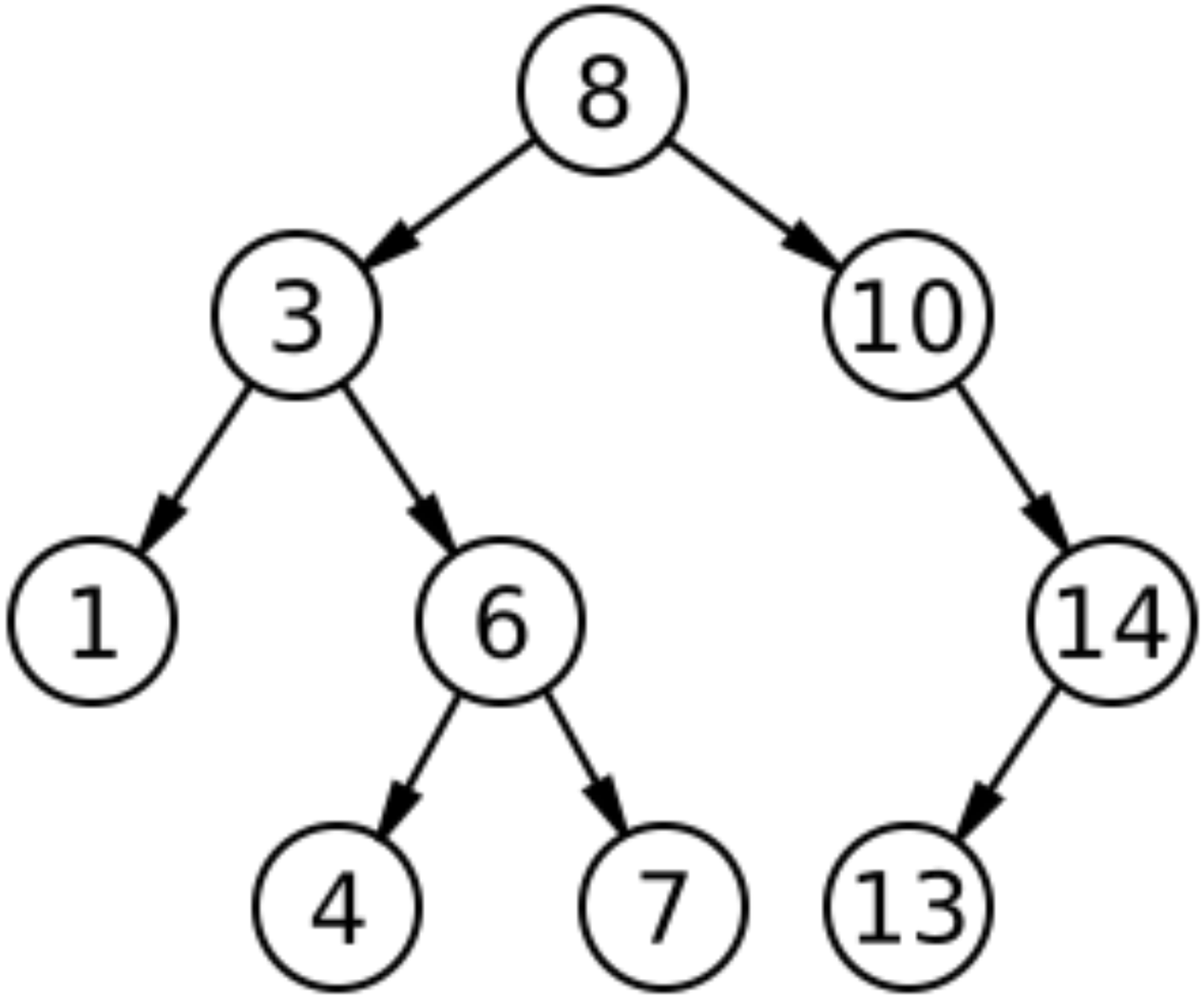
- Explain the structure and components of a graph.
- Identify directed vs undirected edges.
- Identify weighted and unweighted graphs.
- Identify cyclic vs acyclic graphs.
- Identify connected vs disconnected graphs.
- Create and use an Adjacency Matrix

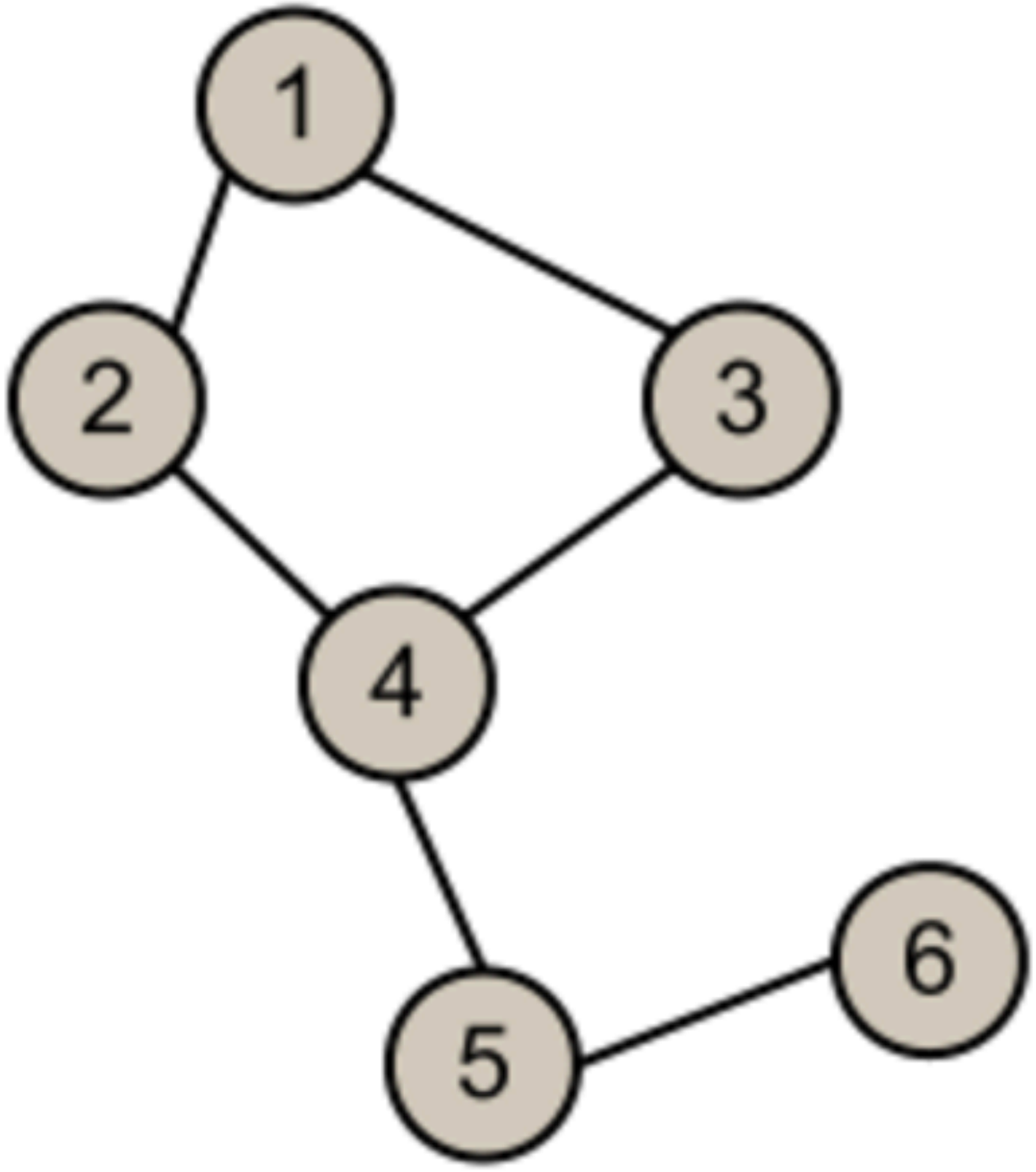
Linear Data Structures

- Array
- Linked List
- Stack
- Queue

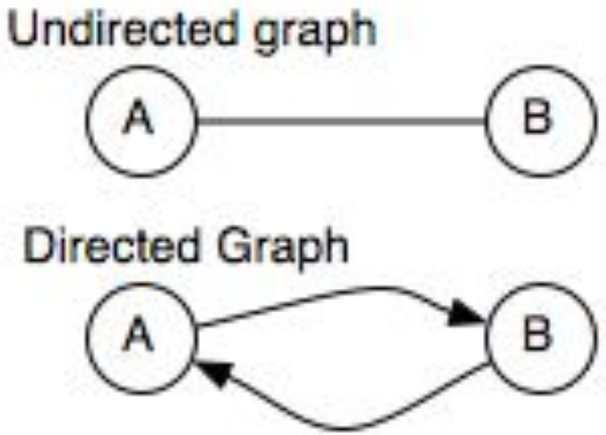
Non-linear Data Structures

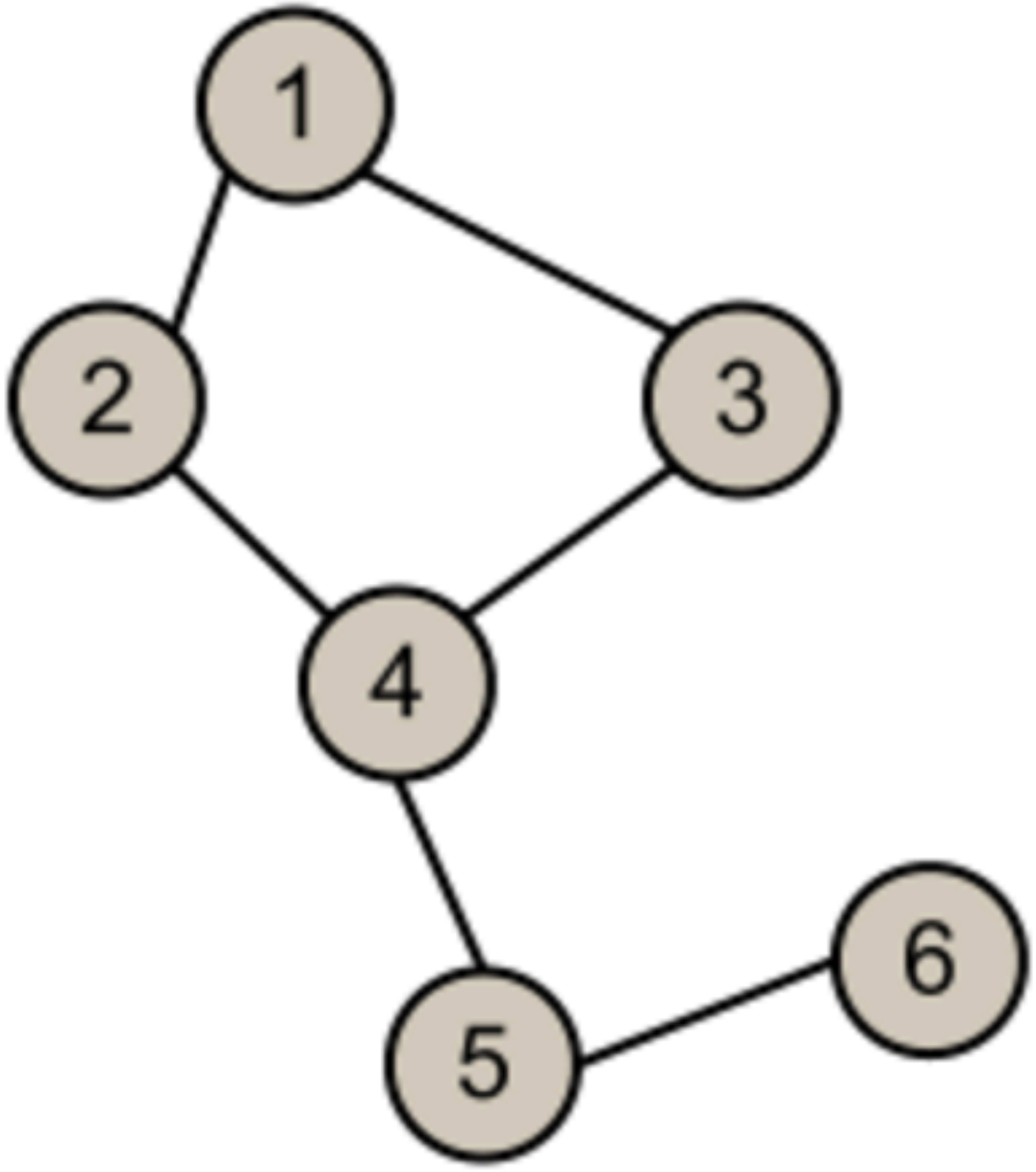
- Tree
  - A tree with N nodes has exactly (N-1) edges.
  - One edge for each parent/ child relationship.
  - All nodes in a tree have a parent, except the root node.
  - All nodes must be reachable from the root
  - There must be exactly one path from the root to a given node.




1
2
3
4
5
6

Pros: Flexibility
Cons: Flexibility


Undirected graph
A
B
Directed Graph
A
B


1
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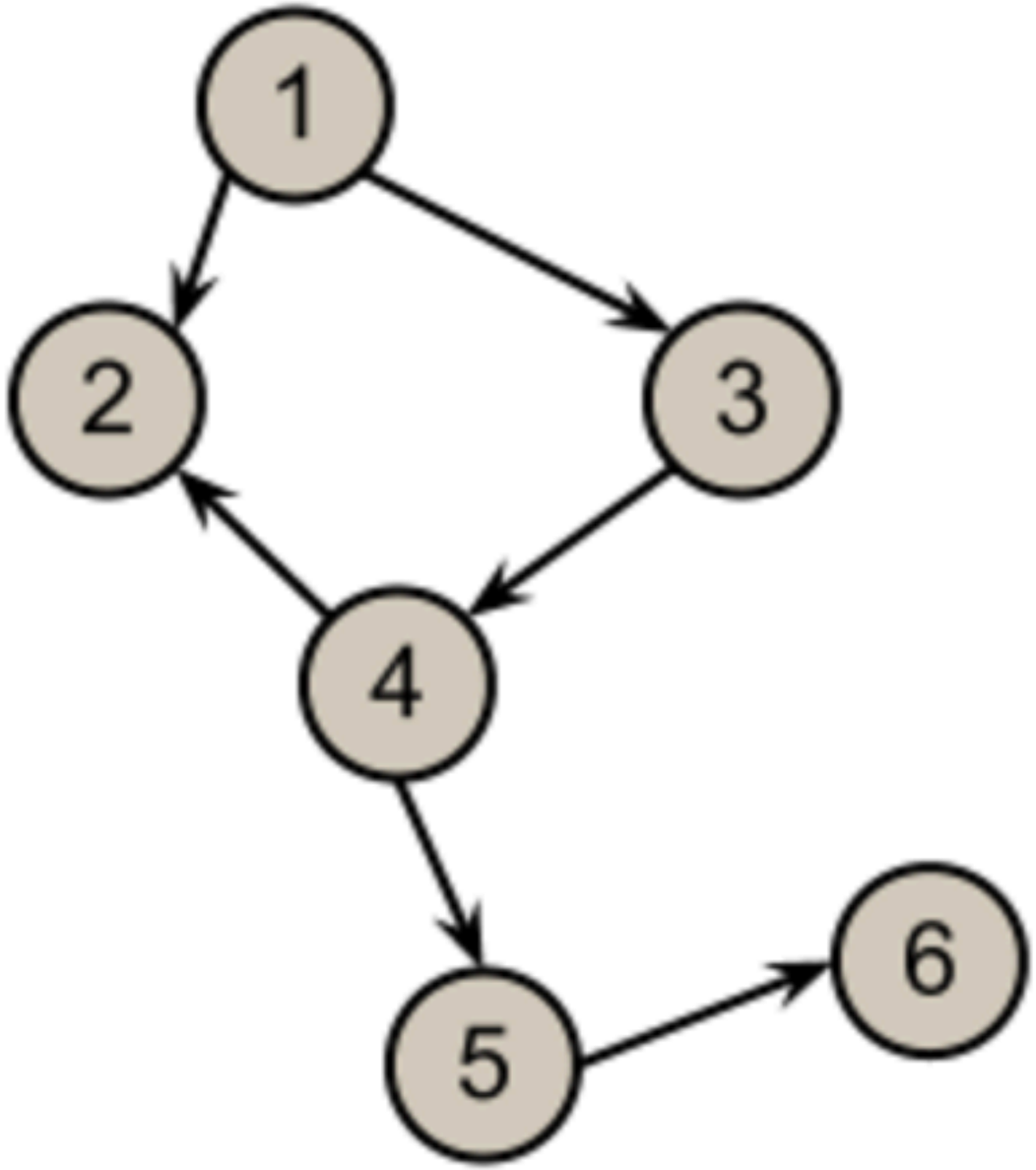
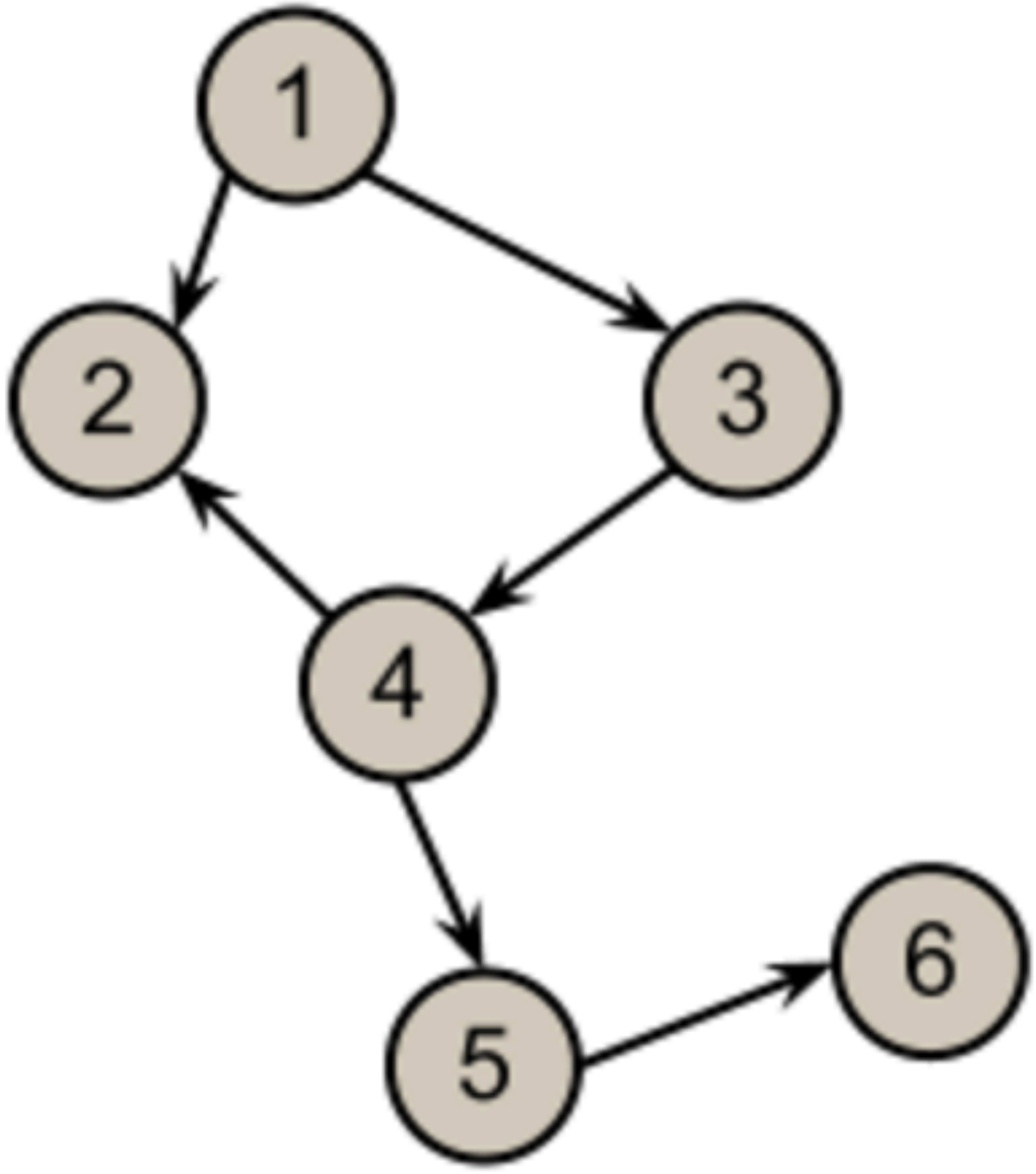

1
2
3
4
5
6

Vocabulary

Digraph: A graph with all *directed* edges.

Undirected Graph: A graph with all *undirected* edges.

Weighted vs Unweighted


1
2
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5
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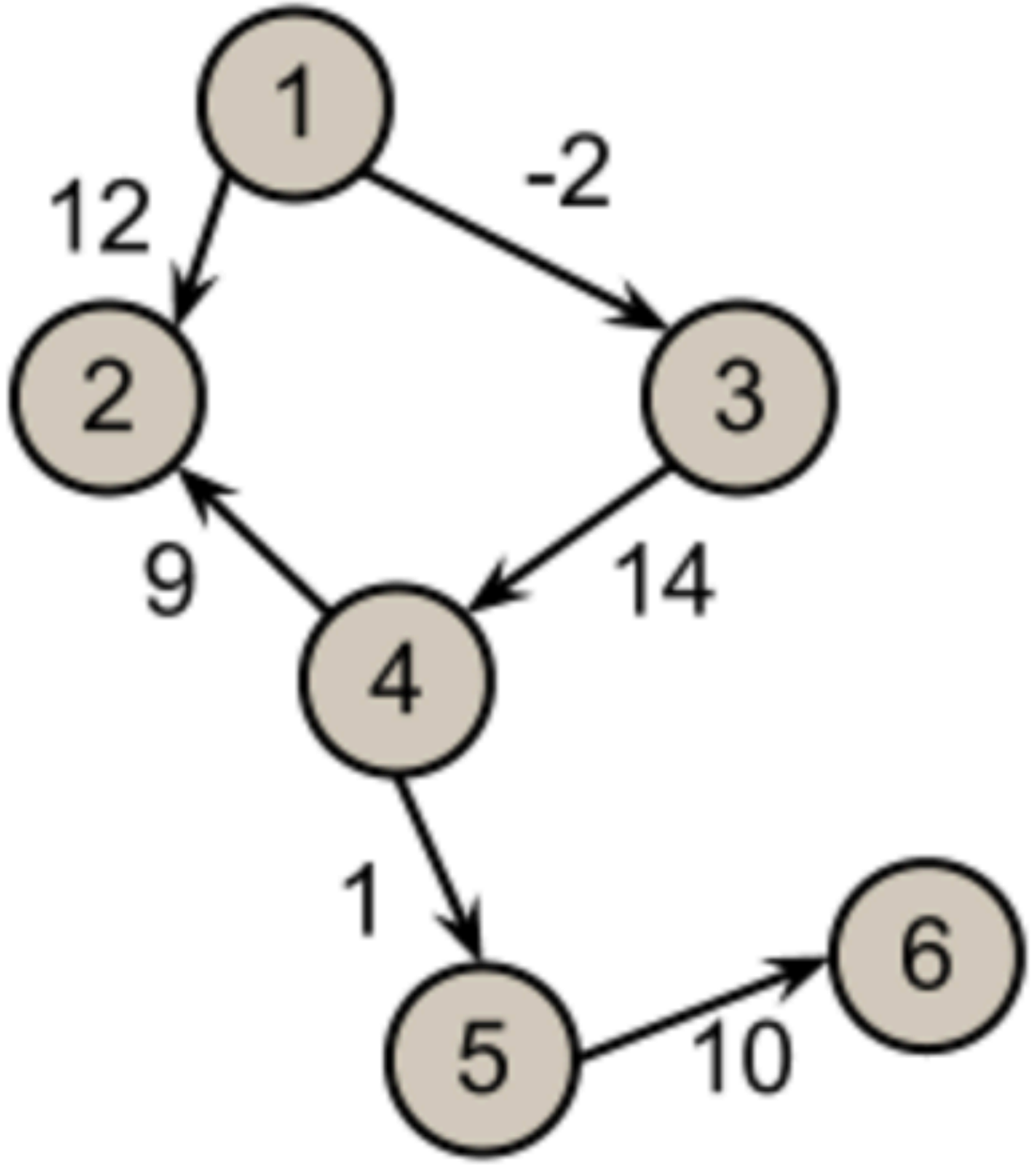
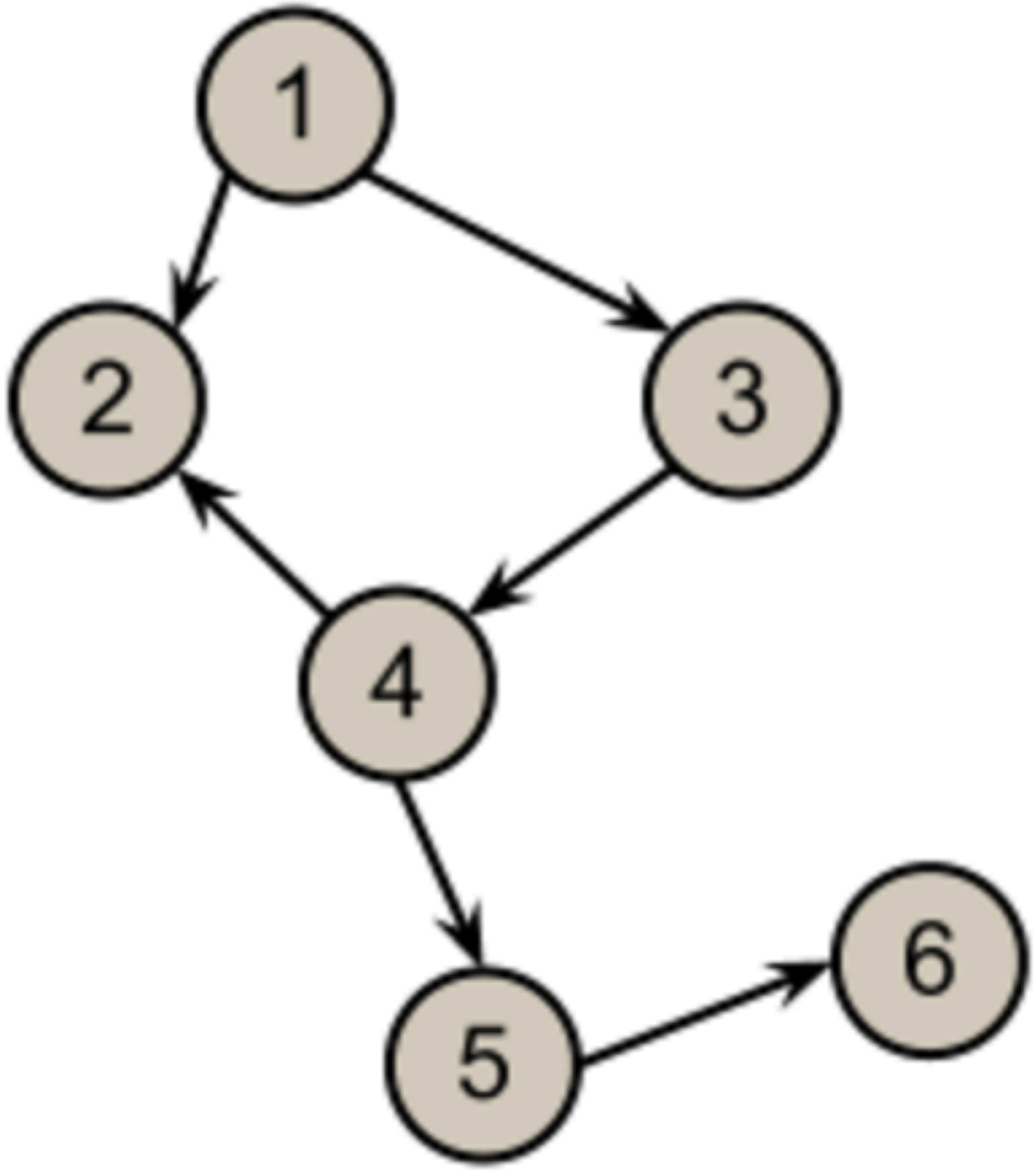
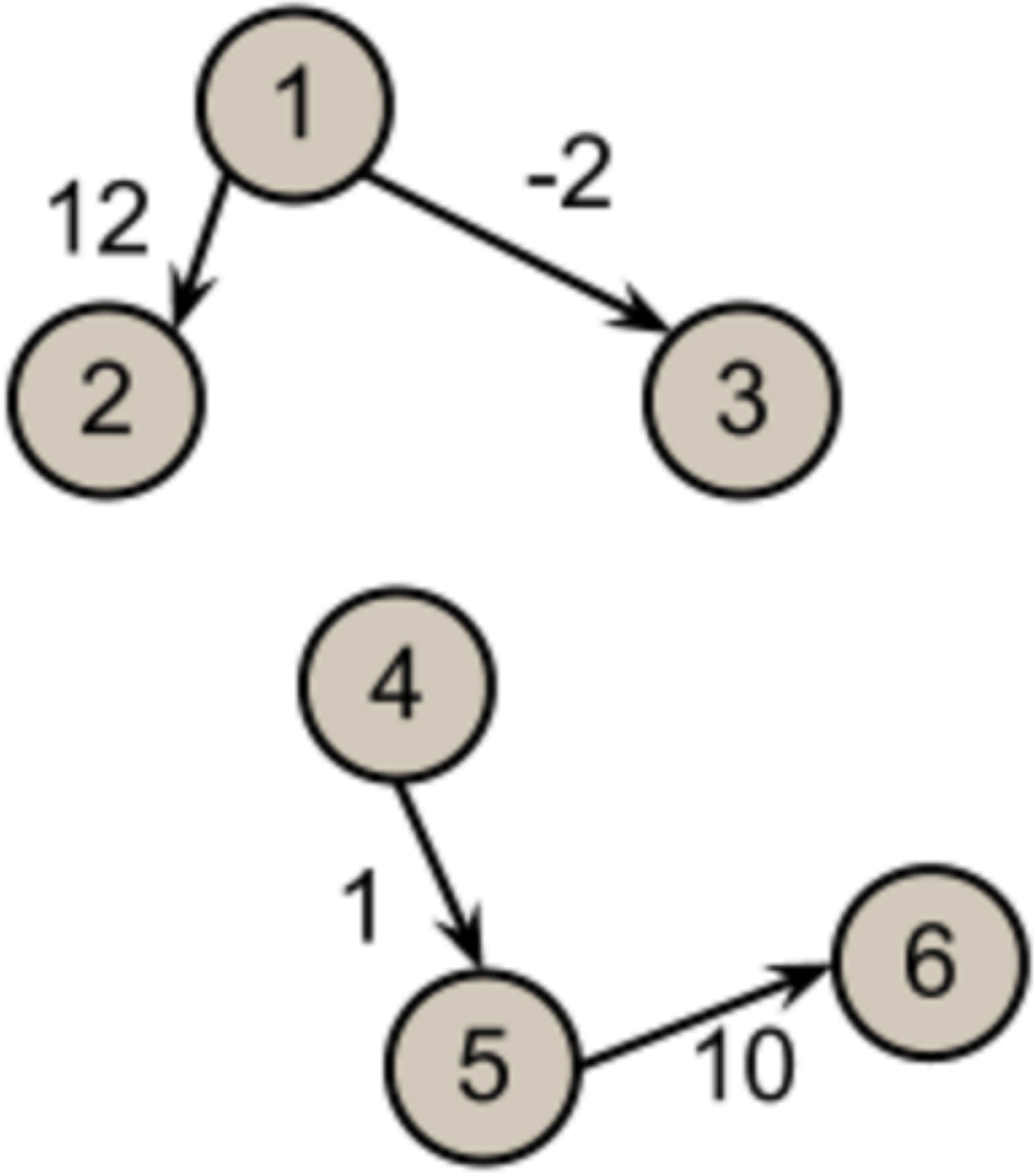
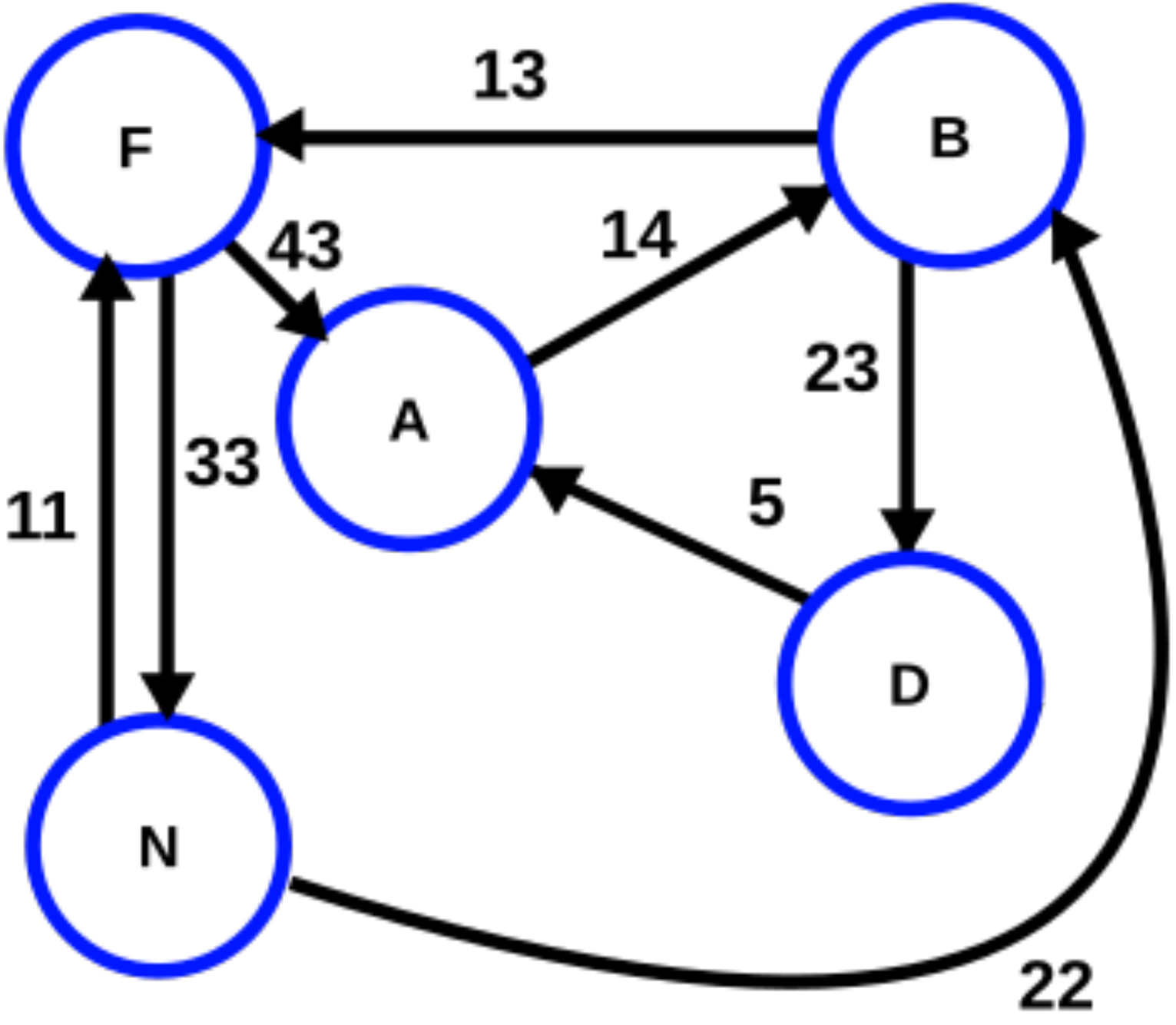

1
12
-2
2
3
9
14
4
1
5
10
6

Cyclic vs Acyclic

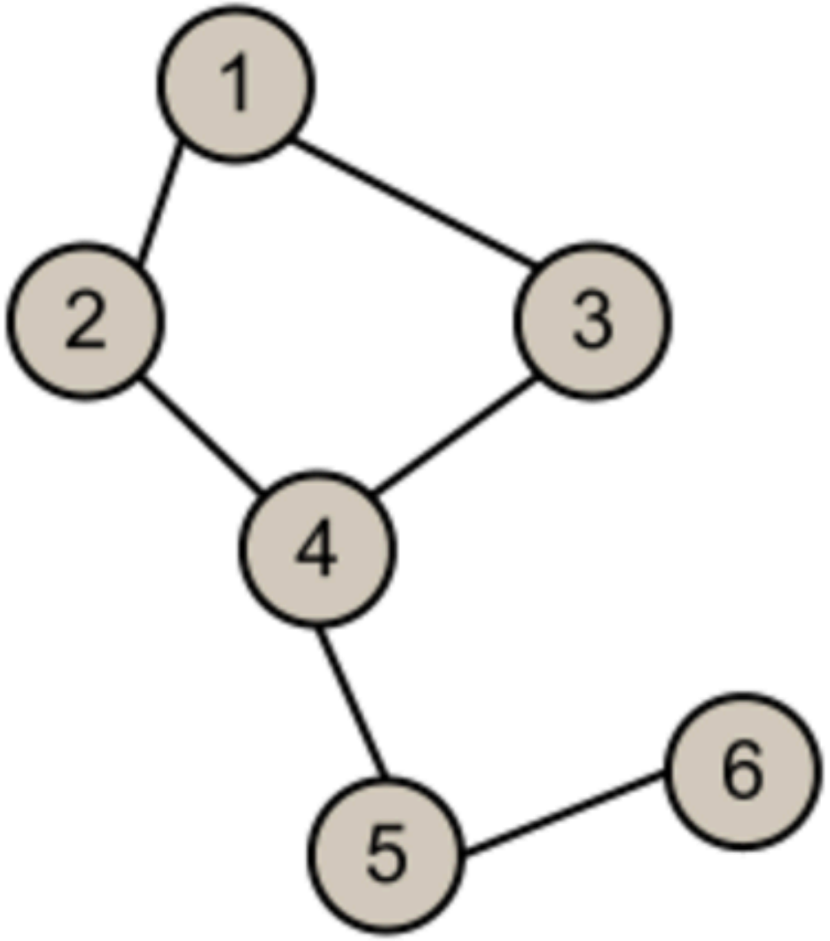

1
2
3
4
5
6

Connected vs Disconnected

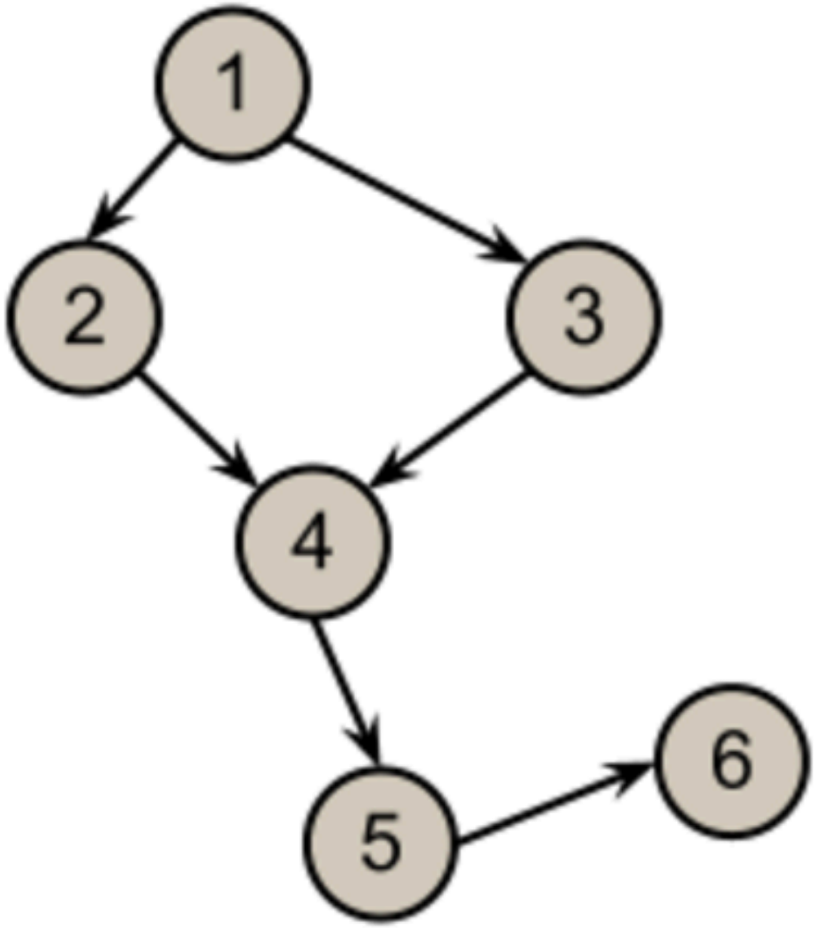

1
12
-2
2
3
4
1
6
5
10


F
B
A
D
N
13
43
14
23
33
11
5
22

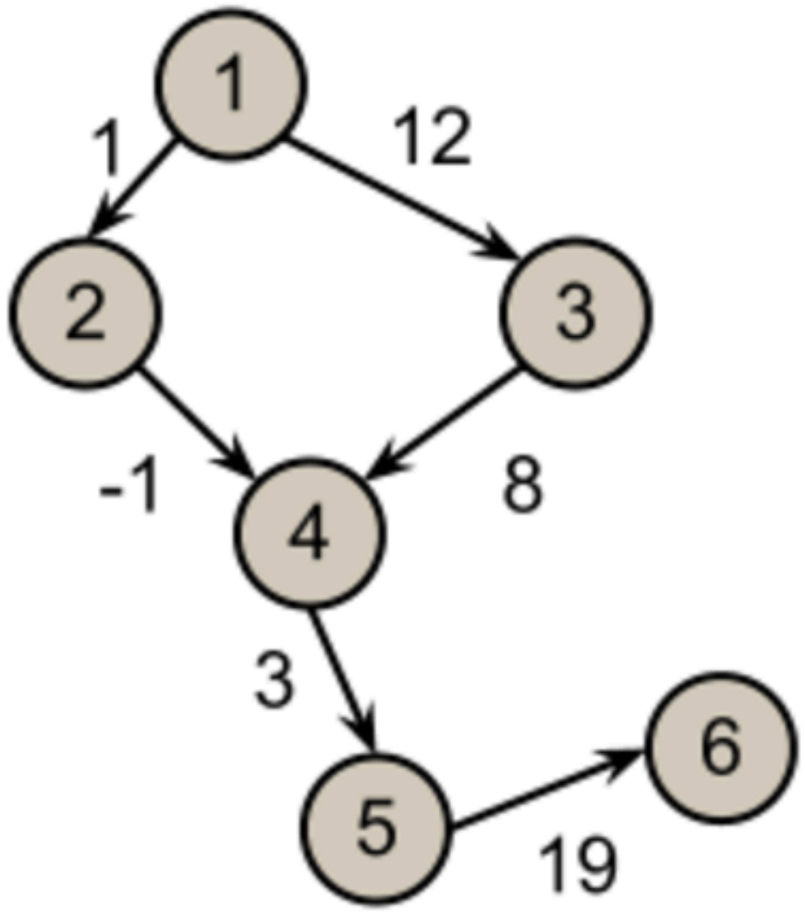
Adjacency Matrix



	1	2	3	4	5	6
1	0	1	1	0	0	0
2	1	0	0	1	0	0
3	1	0	0	1	0	0
4	0	1	1	0	1	0
5	0	0	0	1	0	1
6	0	0	0	0	1	0



	1	2	3	4	5	6
1	0	1	1	0	0	0
2	-1	0	0	1	0	0
3	-1	0	0	1	0	0
4	0	-1	-1	0	1	0
5	0	0	0	-1	0	1
6	0	0	0	0	-1	0



	1	2	3	4	5	6
1	0	1	12	0	0	0
2	-1	0	0	-1	0	0
3	-12	0	0	8	0	0
4	0	1	-8	0	3	0
5	0	0	0	-3	0	19
6	0	0	0	0	-19	0

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Questions?