

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

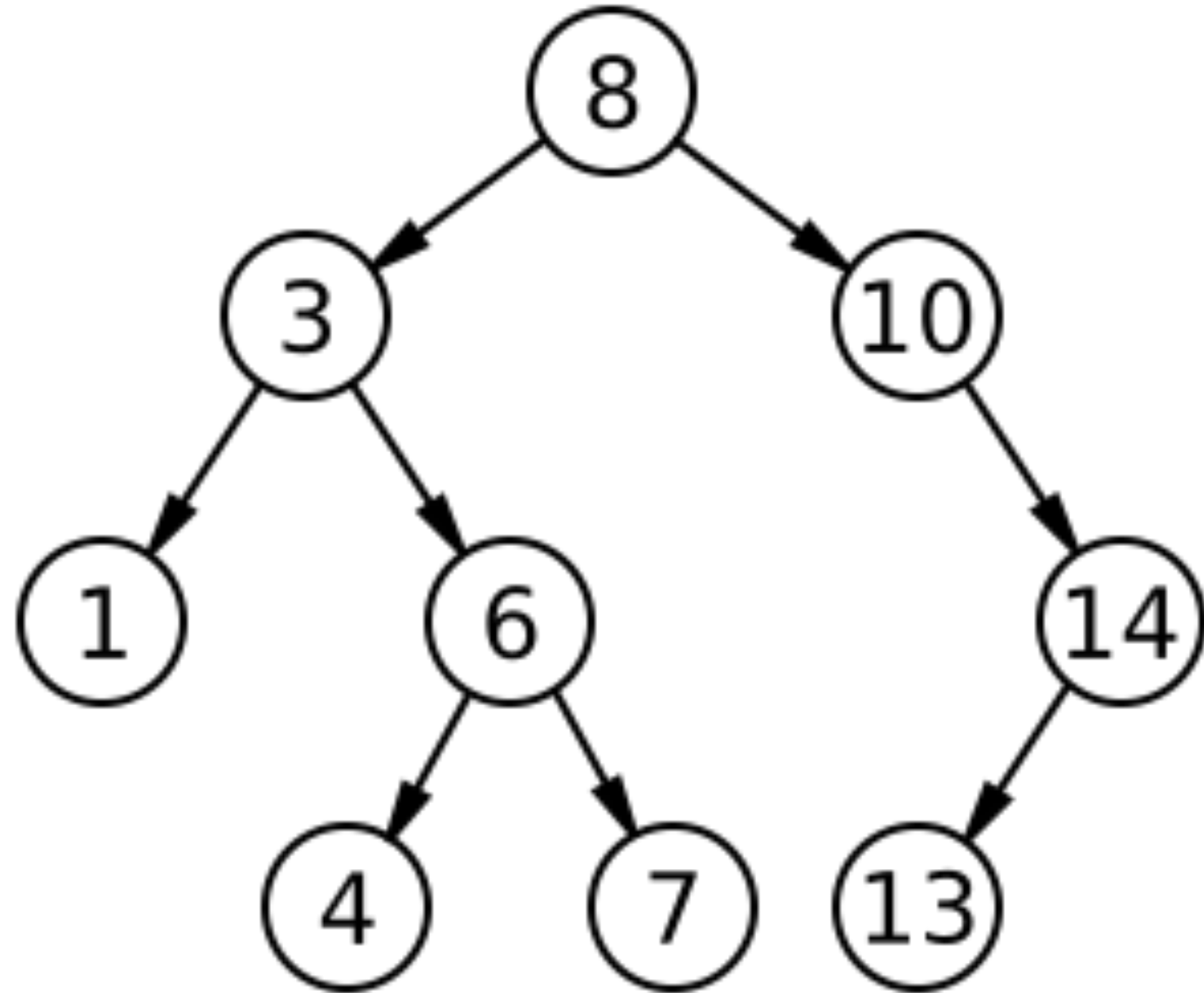
Linear Data Structures

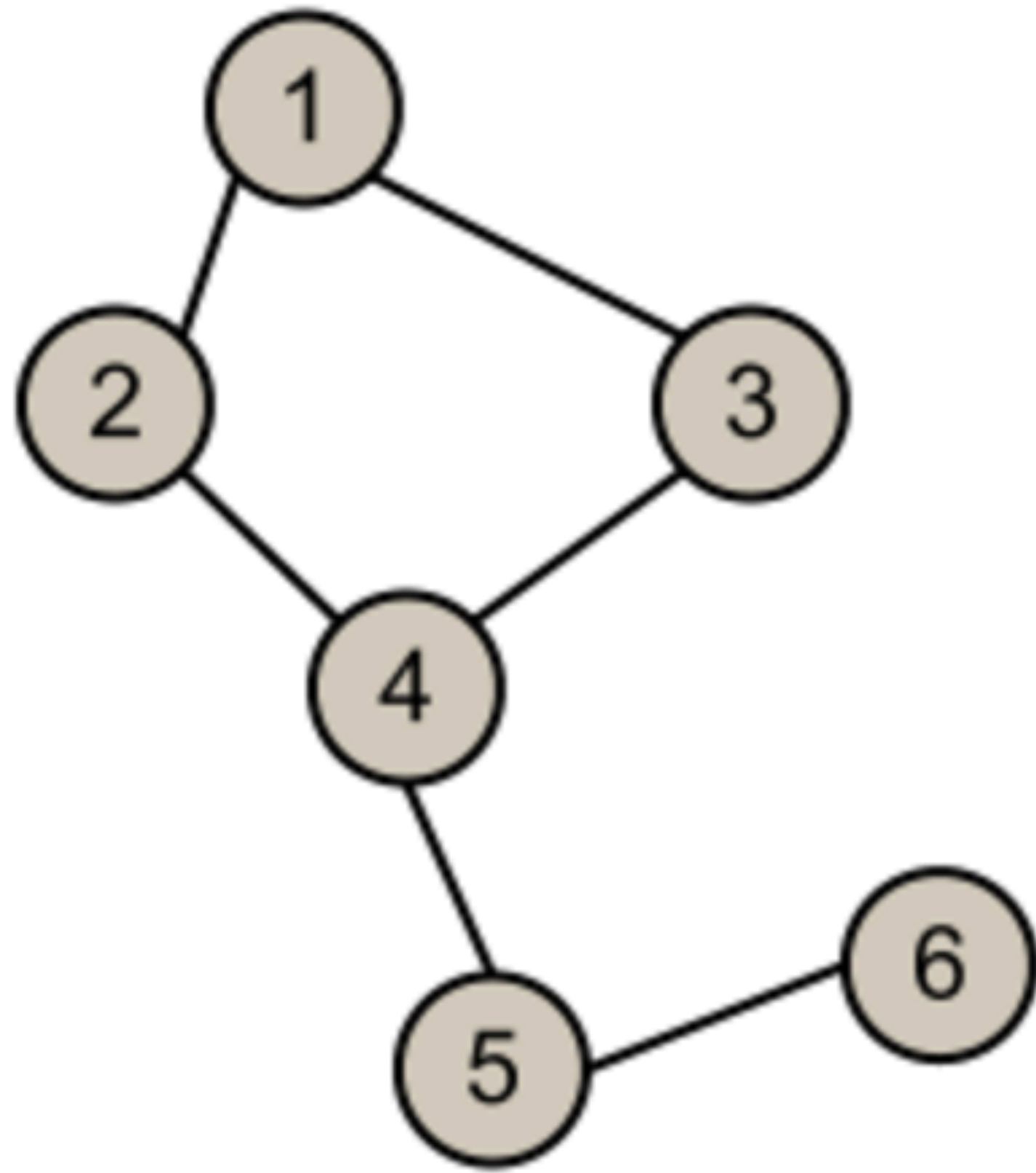
- >> Array
- >> Linked List
- >> Stack
- >> Queue

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.





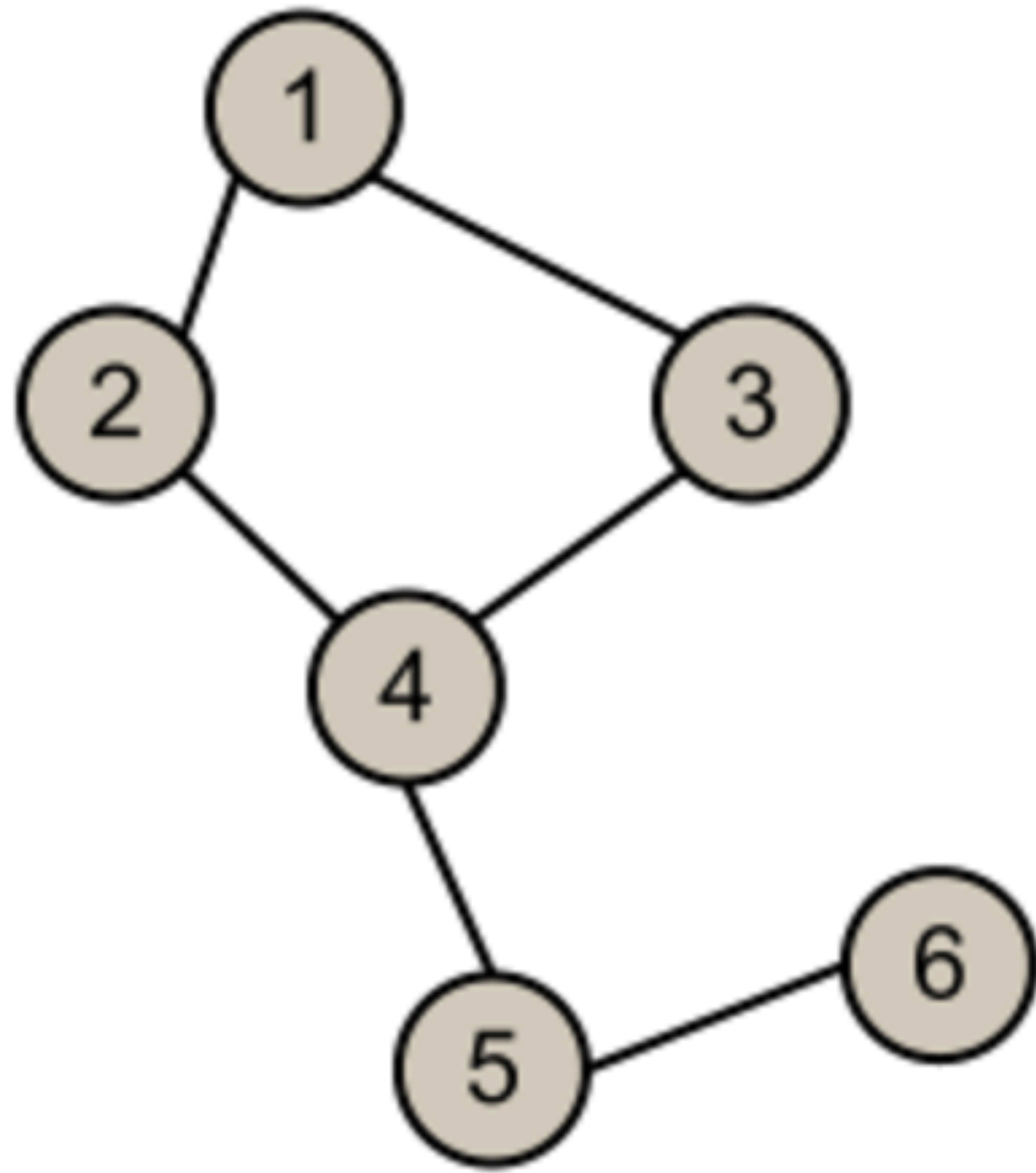
Pros: Flexibility
Cons: Flexibility

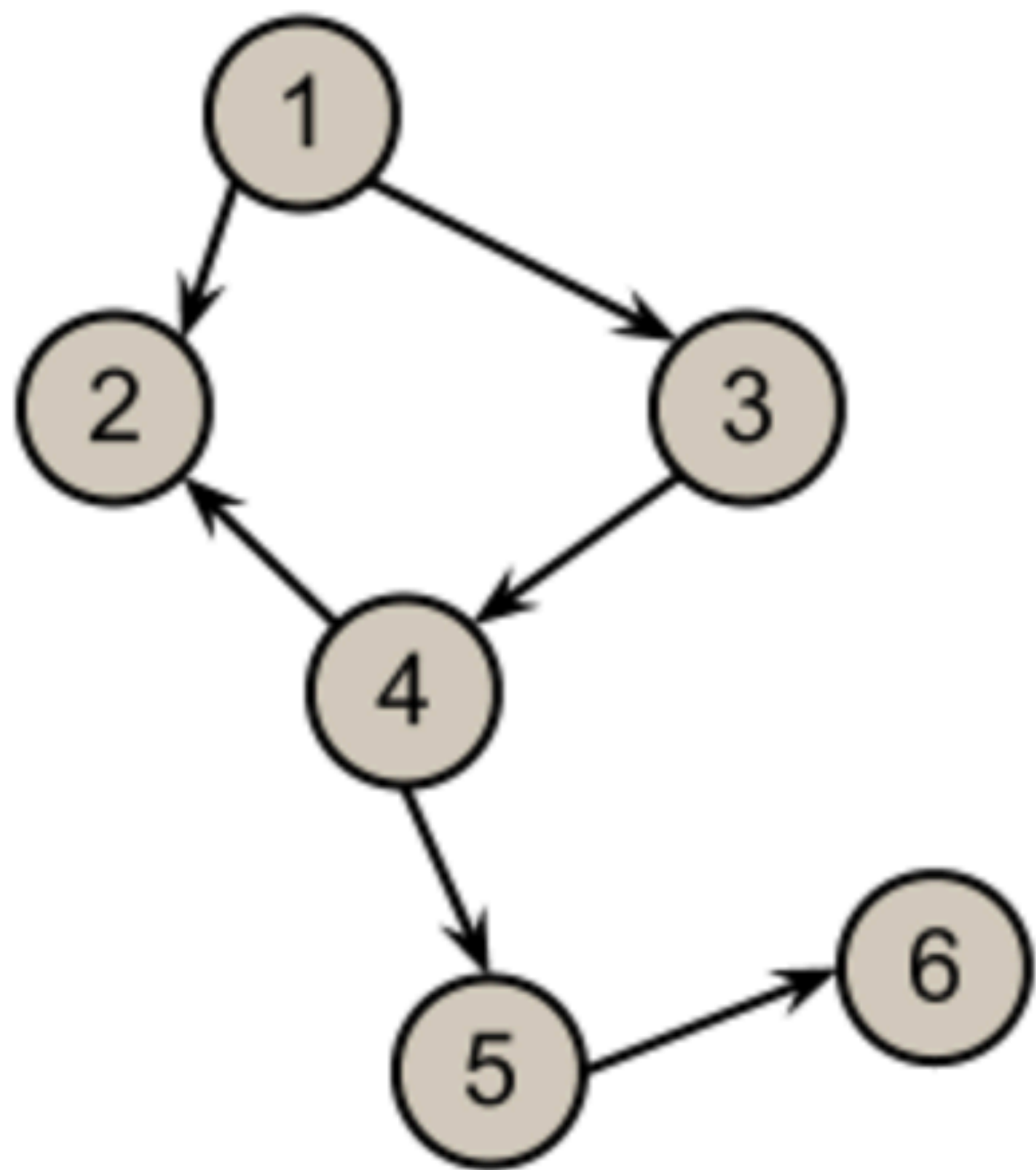
Undirected graph



Directed Graph





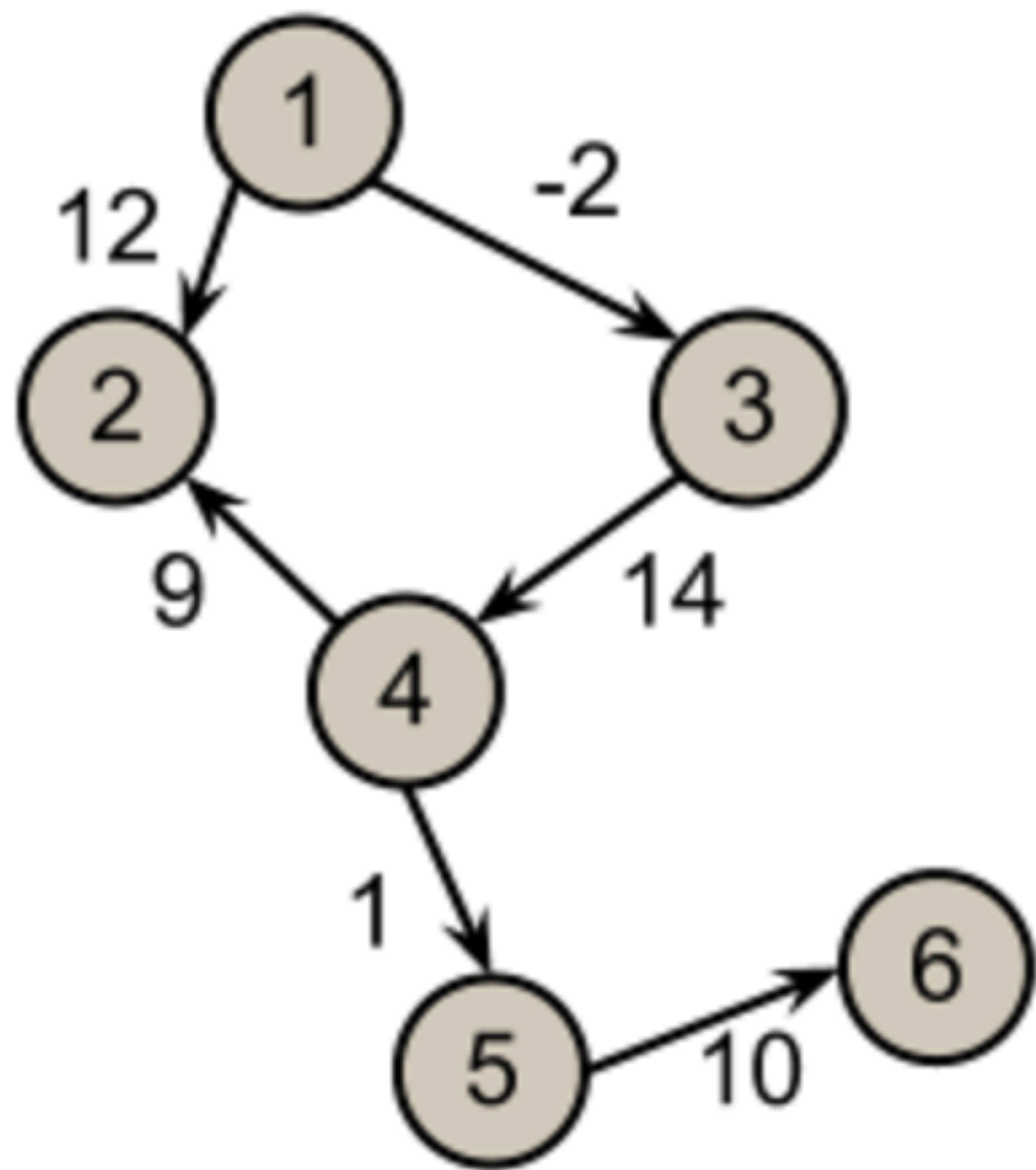
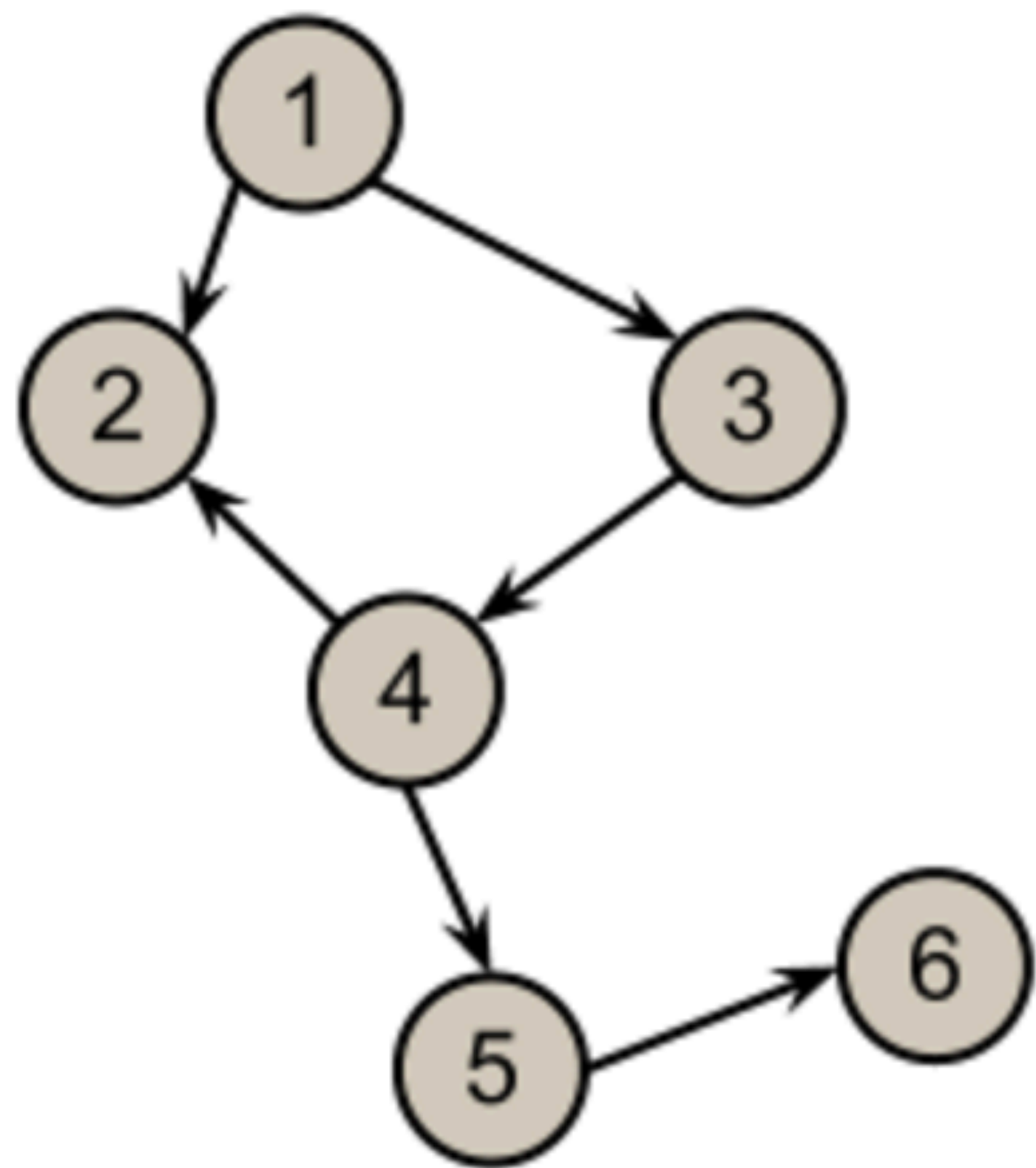


Vocabulary

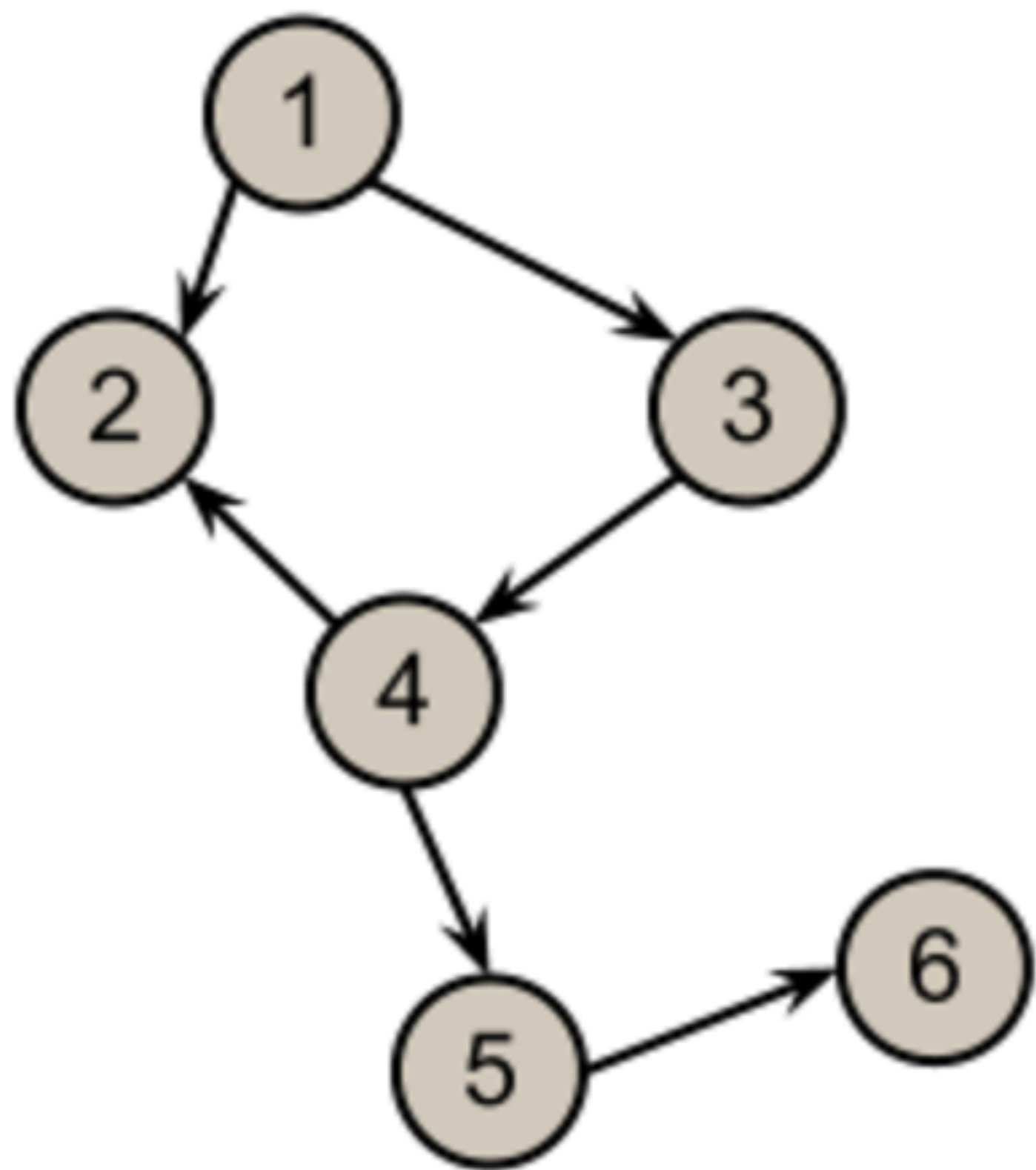
Digraph: A graph with all *directed* edges.

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

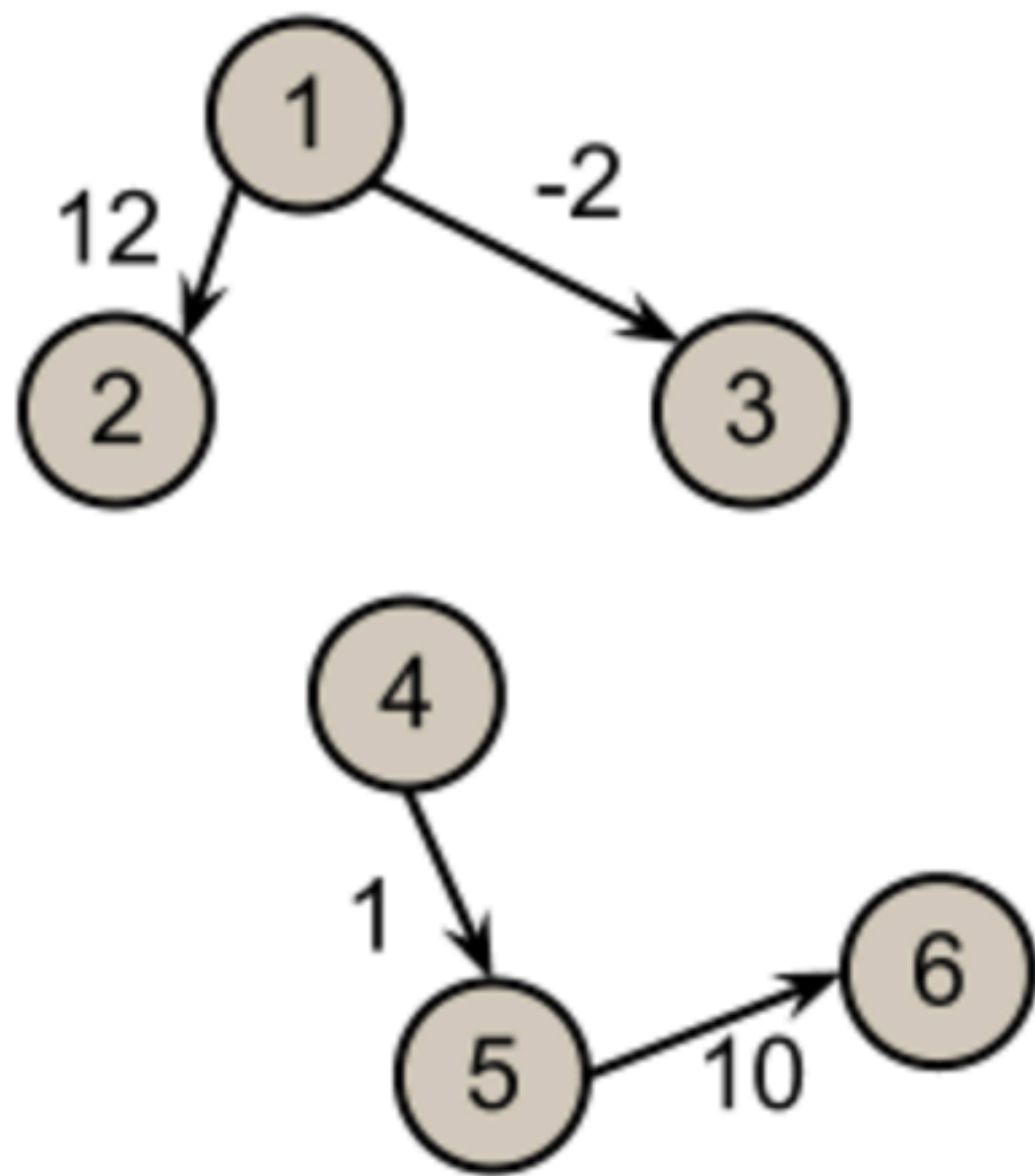
Weighted vs
Unweighted

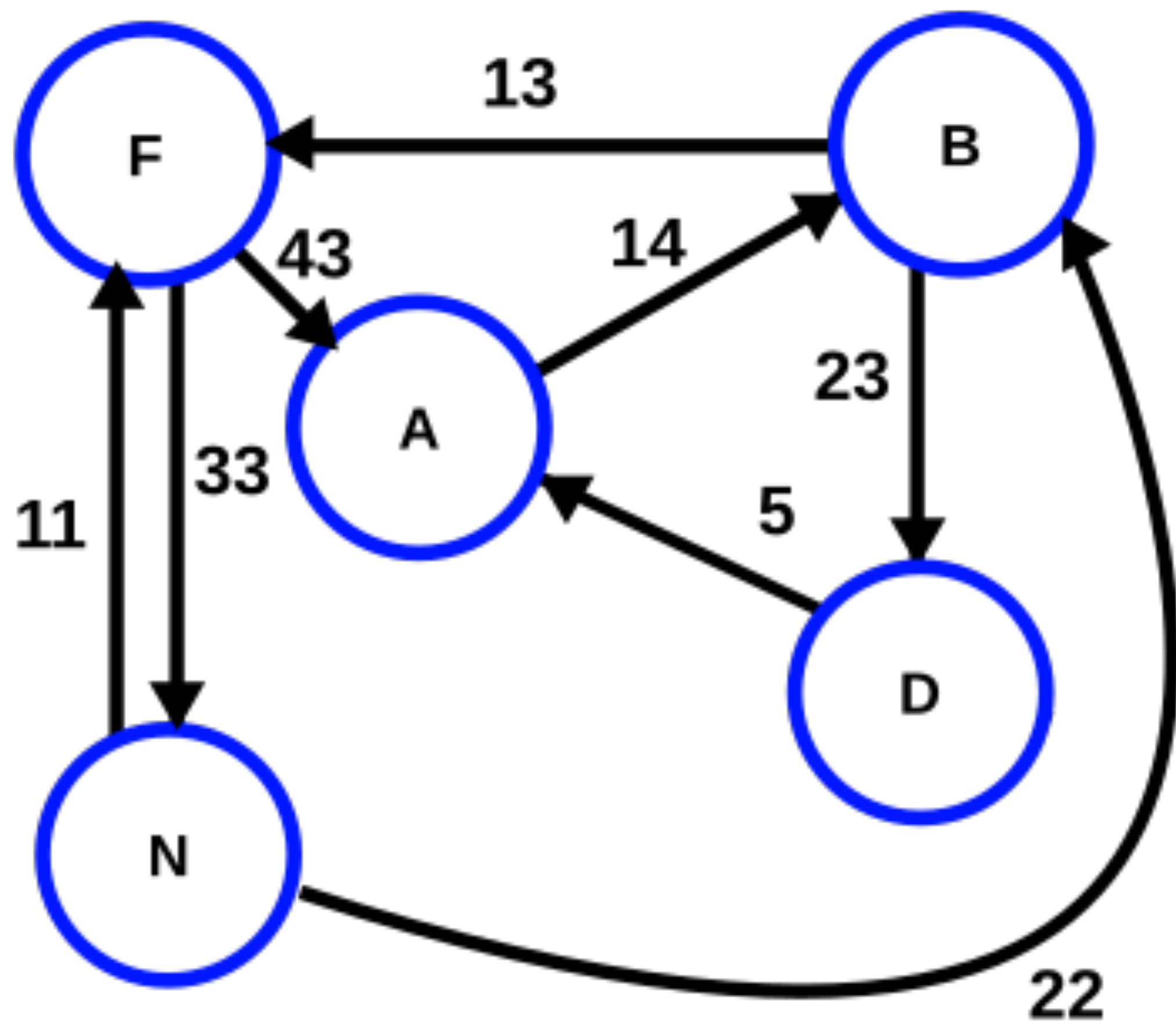


Cyclic vs Acyclic

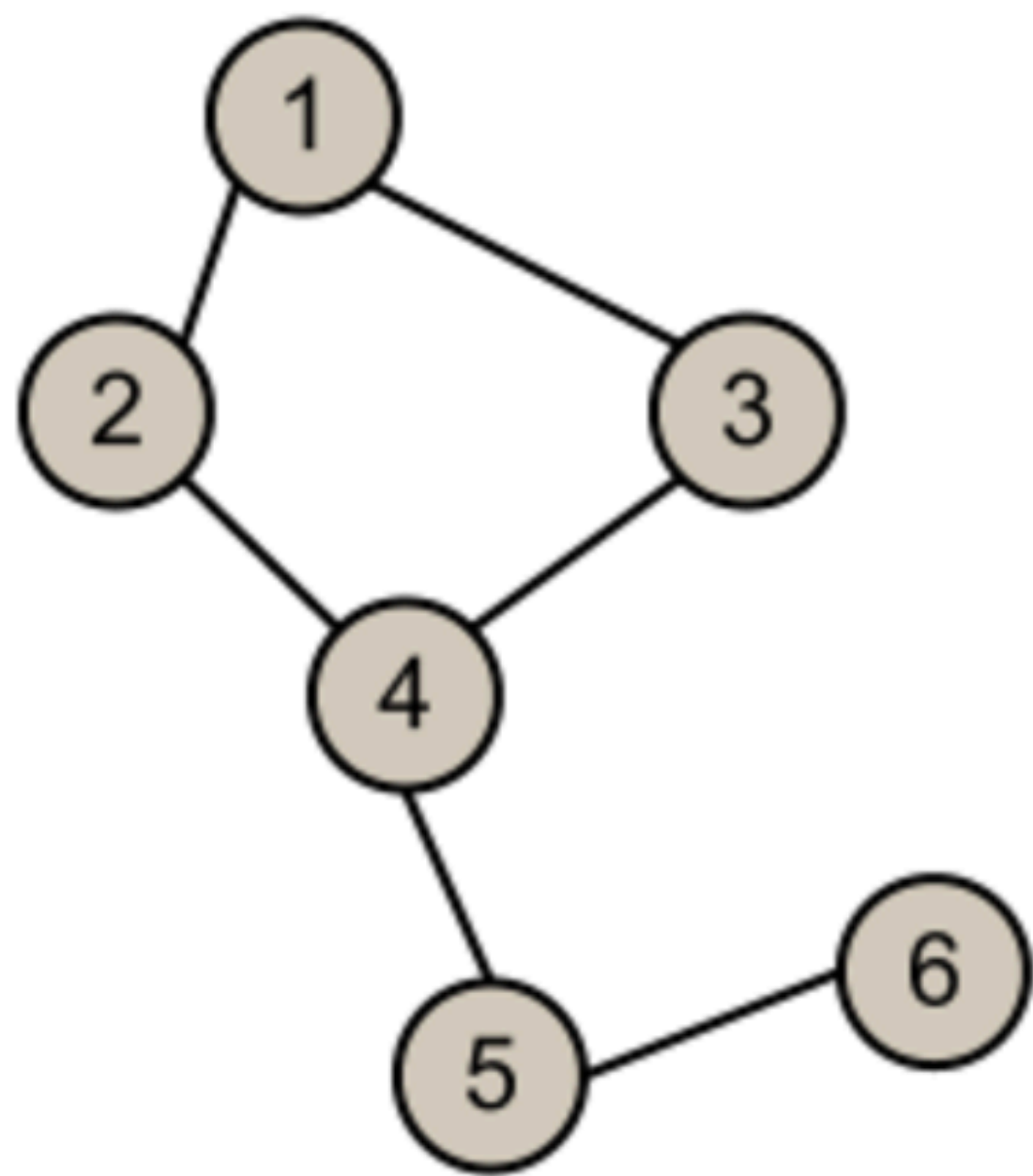


Connected vs
Disconnected

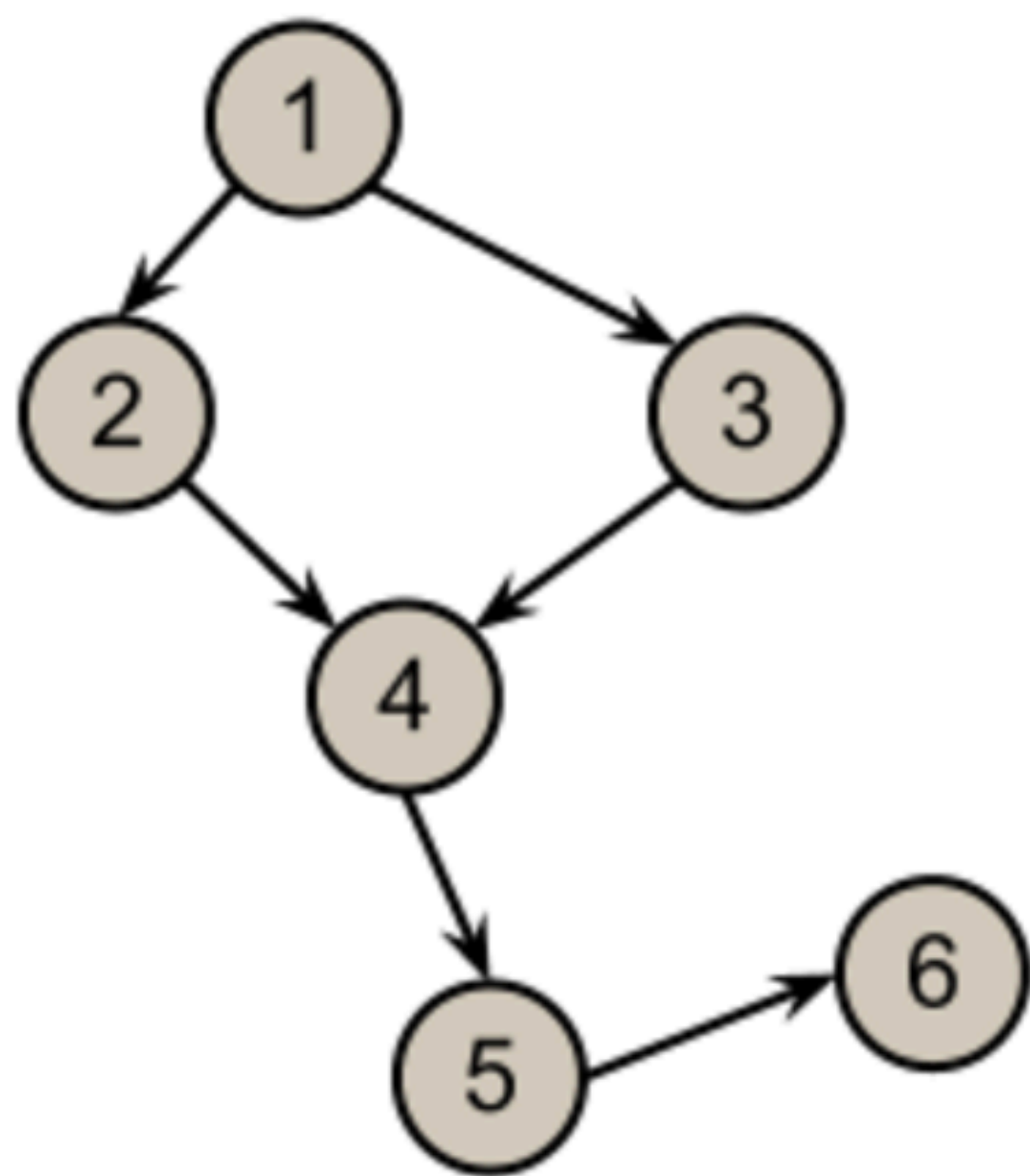




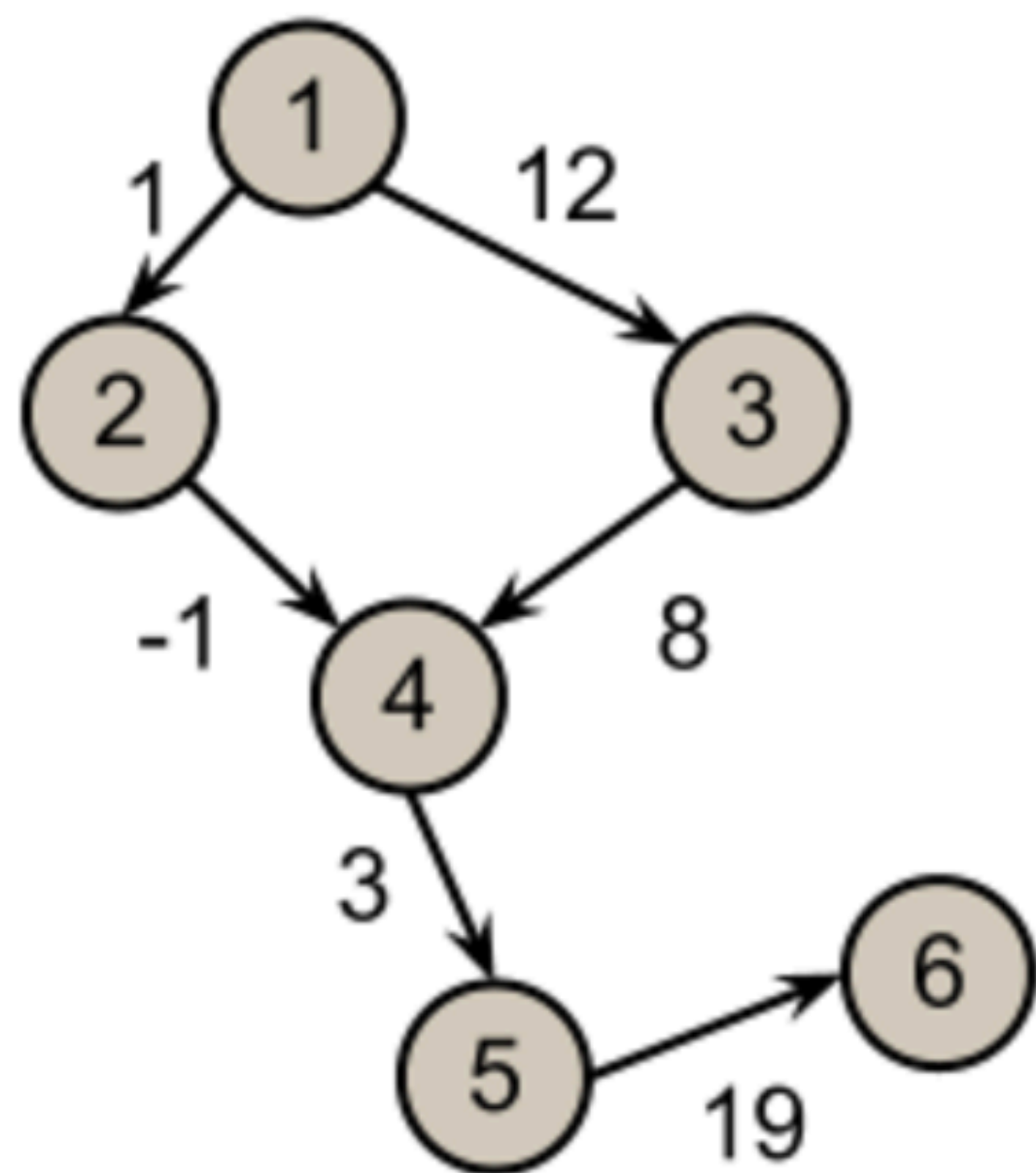
Adjacency Matrix



	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?