THANK YOU DEAR STUDENT & GOOD LUCK

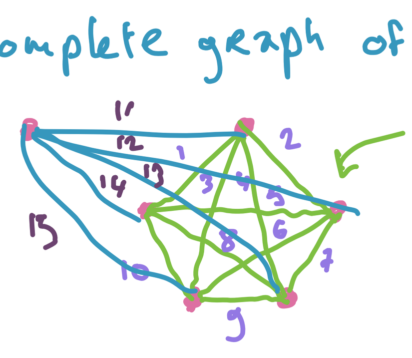
Lecture 26 : Final graph concepts

- bipartite graphs
- cycles
- connected components
- trees

Previously
* degree
* degree sequence
* graph isomorphism
* paths

Q1-2: Graph Medley

Q2. Complete graph of size 5, $\boxed{K_5}$

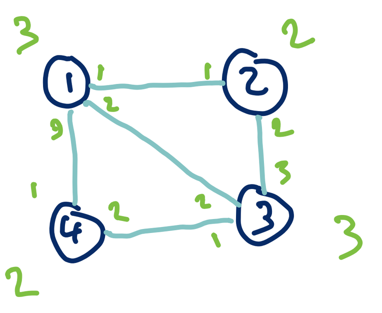


complete graph on 5 vertices

$\frac{(n-1)n}{2}$

also $\binom{n}{2}$

Q7.



(3, 3, 2, 2)

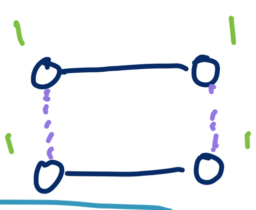
Q9. Example of two graphs with the same number of vertices, but NOT isomorphic.

disconnected graph $\not\equiv$ complete graph

↳ Can we find an example with two graphs that have the same number of vertices AND edges but are NOT isomorphic?

Q10. The degree sequence (1, 1, 1, 1) is for this graph

(2, 2, 2, 2)

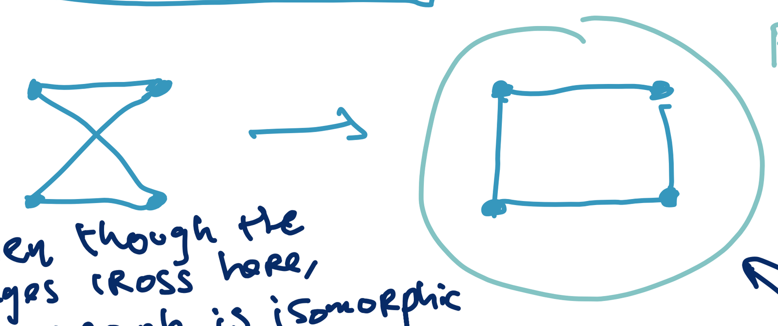


(1, 1, 1, 1)

thx Caroline

Q11. $\boxed{\sum_{x \in V} \deg(x) = 2 \cdot |E|}$ (handshake lemma)

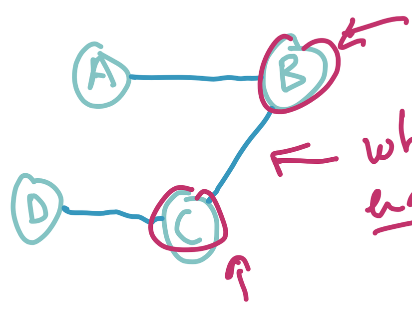
Q13.



planar

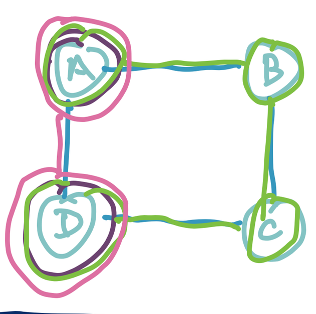
Even though the edges cross here, the graph is isomorphic to another way of drawing it, where the edges don't cross

Q14.



what are the endpoints of this edge?

Q15



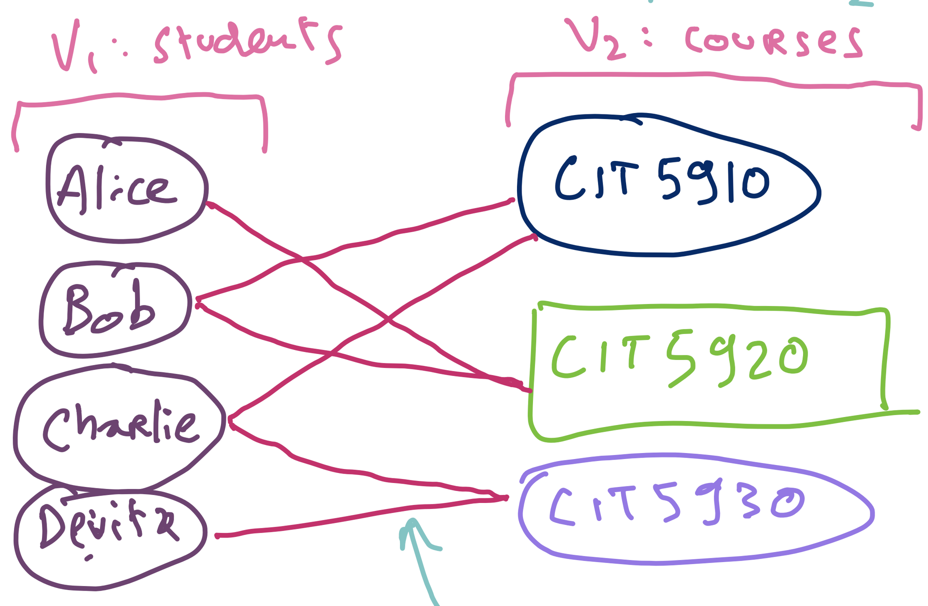
A B C D } two paths
A D

BIPARTITE GRAPH

A bipartite graph $B = (V, E)$ is a graph of which the vertices can be partitioned in two disjoint sets V_1 and V_2 (partitions of V) $B = (V_1 \cup V_2, E)$ such that no edge exists between the vertices of V_1 and V_2.

$V = V_1 \cup V_2$
$V_1 \cap V_2 = \emptyset$

Example



- edges are only between a student and a course

edge when a student is enrolled in a course

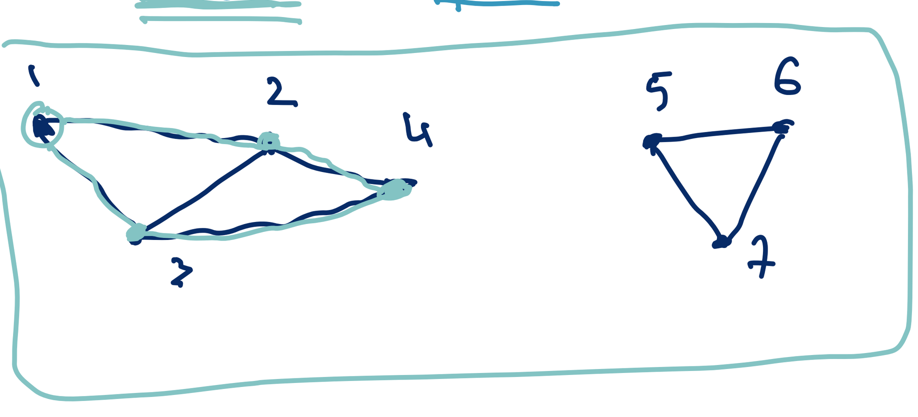
Useful queries

- How many students in a course
  ↳ count degree of the corresponding course node, ex. 2 students in CIT5920
- The weights could contain information about the student course (GRADE, ATTENDANCE, MOTIVATION)
- Find all the courses a student is enrolled in
- Identify students sharing the same courses

CONNECTED COMPONENTS, TREES AND CYCLES

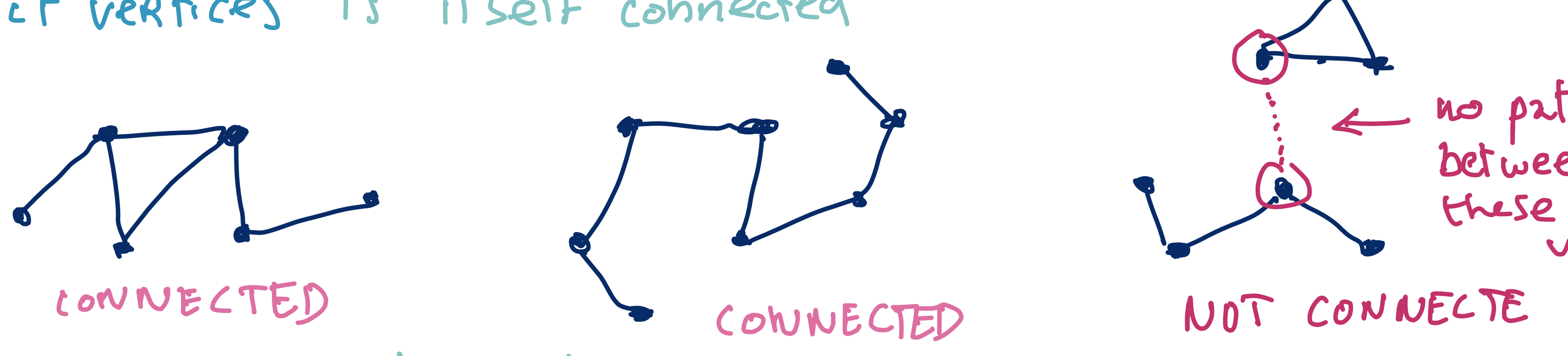
- In an undirected graph, two vertices x and y are connected if and only if there exists a path between x and y

1 is connected:
- 2
- 3
- 4



1 is NOT connected to: 5, 6, 7

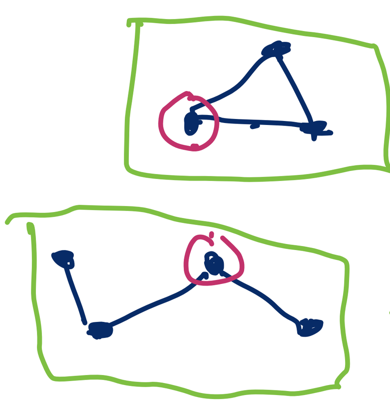
- A graph is said to be connected if every pair of distinct vertices is itself connected



CONNECTED CONNECTED NOT CONNECTED

no path between these 2 vertices

- Each connected subgraph is called a connected component

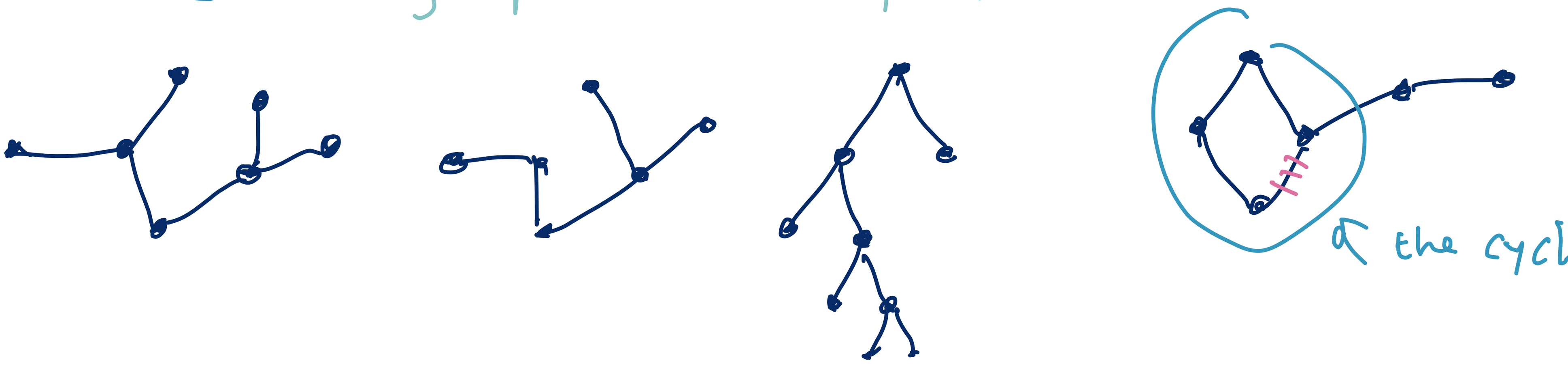


first connected component

second connected component

- A tree is a graph without any cycles.

DIVIDE AND CONQUER



the cycle

TREES because they have no cycles

NOT A TREE because it has cycle