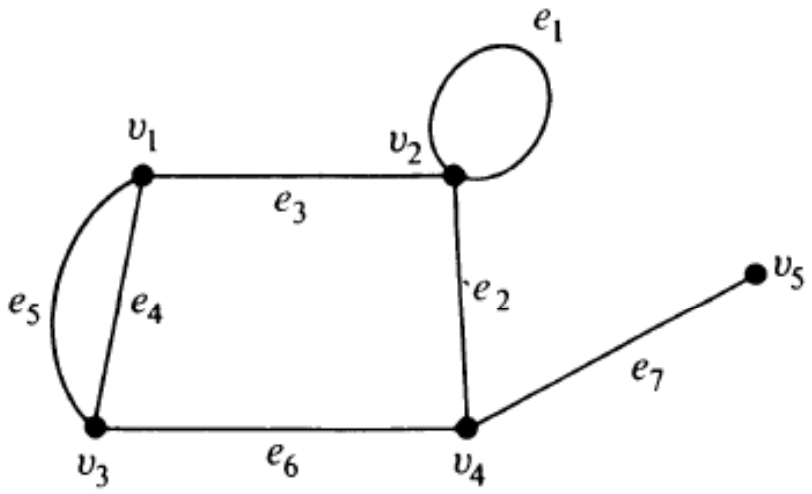
DAY 2

What is a Graph?

A *linear*† *graph* (or simply a *graph*) $G = (V, E)$ consists of a set of objects $V = \{v_1, v_2, \ldots\}$ called *vertices*, and another set $E = \{e_1, e_2, \ldots\}$, whose elements are called *edges*, such that each edge e_k is identified with an unordered pair (v_i, v_j) of vertices. The vertices v_i, v_j associated with edge e_k are called the *end vertices* of e_k.

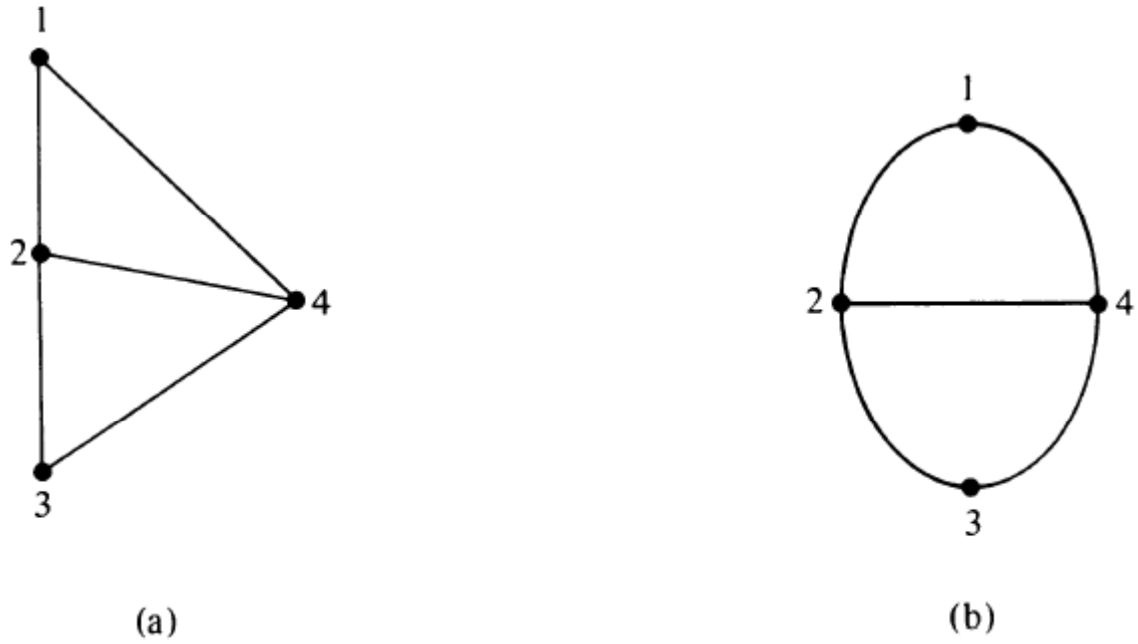


Terminologies
Self Loop
Parallel Edge
Pendant Vertex
Incidence
Adjacency
Simple Graph

Question for Self Study

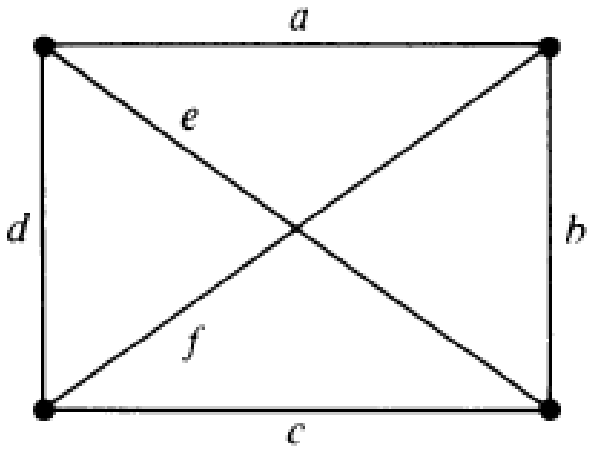
1. What is multi graph? Show with proper diagram.
2. What do you mean by ‘unordered pair of vertices’?

Contd..



Same graph drawn differently

Contd..

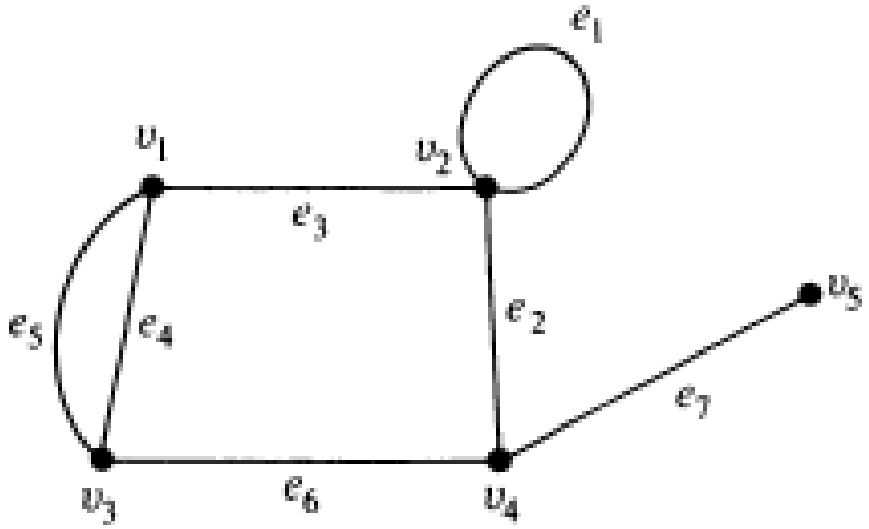


Edges e and f are not intersecting each other

Question for Self Study

1. What are the other names for Graph, edge and vertex?

Degree



d(v1) = 3 d(v2) = 4

d(v3) = 3 d(v4) = 3

d(v5) = 1

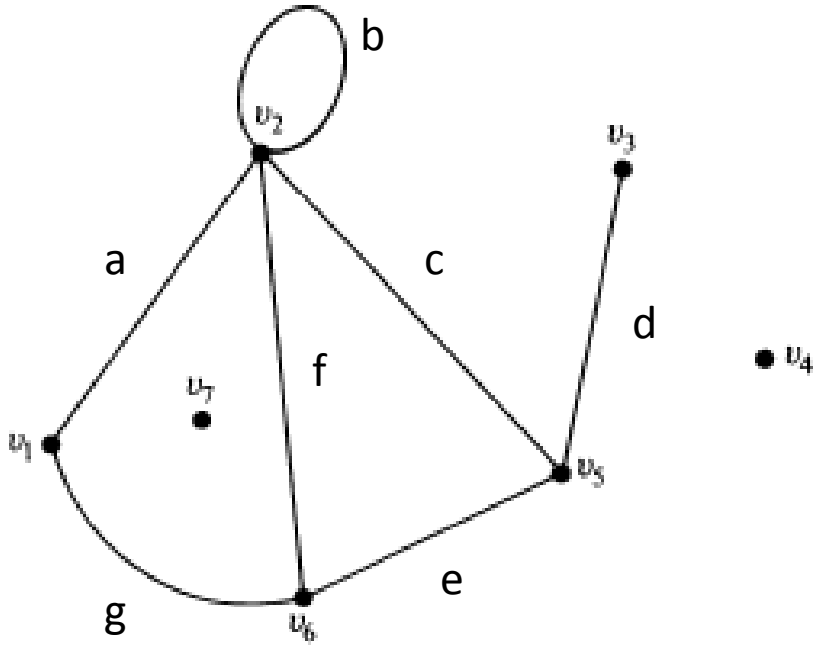
Total degree = 14

No. of edges = 7

sum of the degrees of all vertices is twice the number of edges in G.

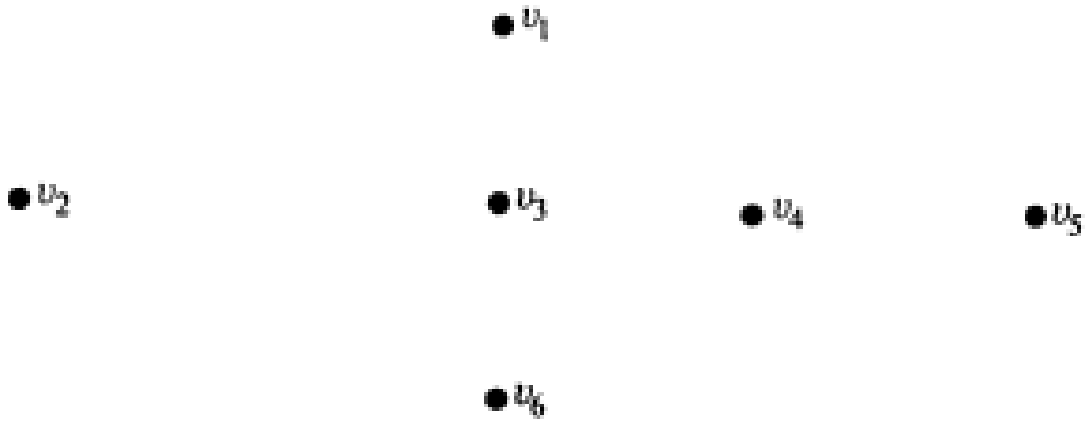
$$\sum_{i=1}^{n} d(v_i) = 2e$$ **Handshaking Lemma**

Contd…



Terminologies
Isolated Vertex
Series Edge

Contd..



Null graph of six vertices.

Question for Self Study

1. Can there be a null graph with all edges but no vertex?

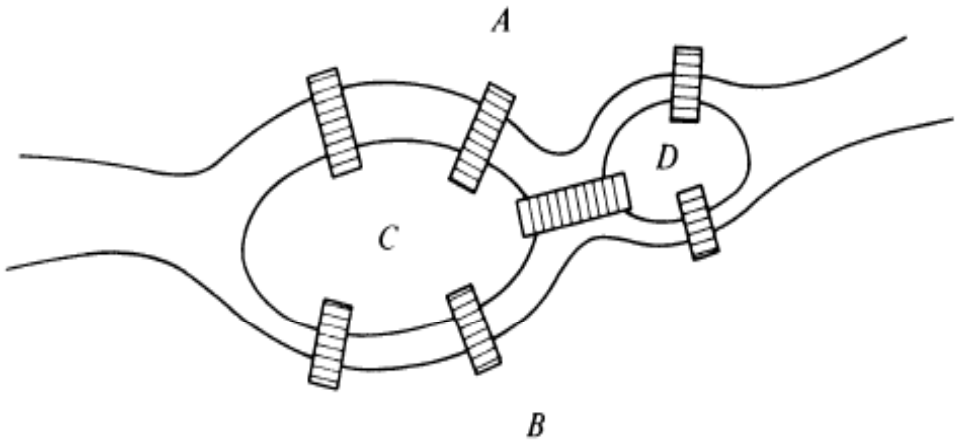
2. Show that – “the number of vertices of odd degree in a graph is always even”.

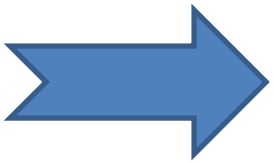
3. What is Finite Graph and Infinite Graph? Discuss with e.g.

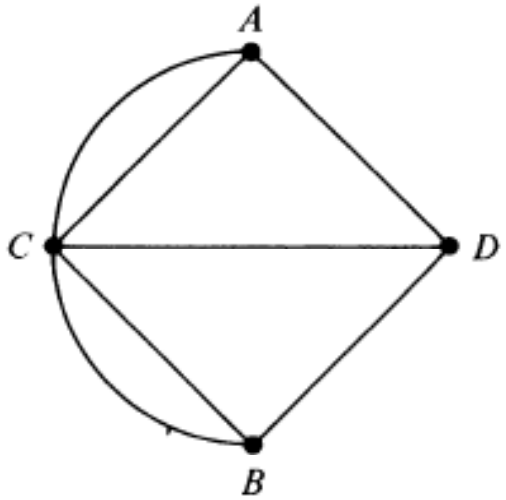
Applications of Graphs

Königsberg Bridge Problem.

Leonhard Euler (1736)

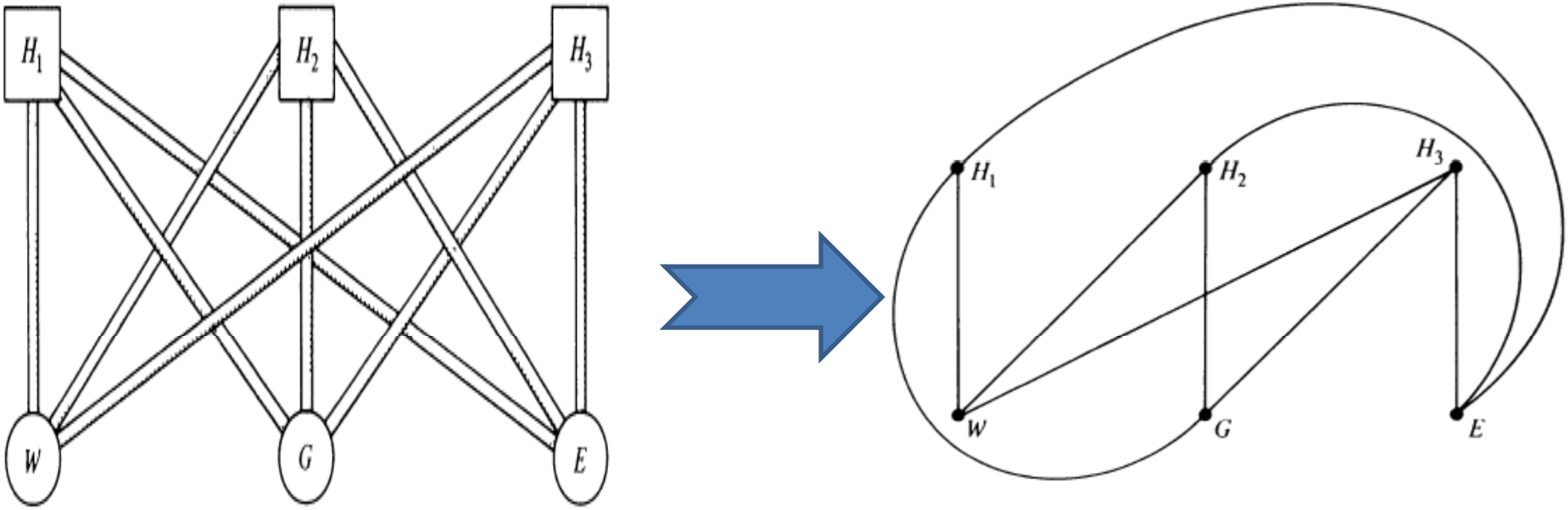




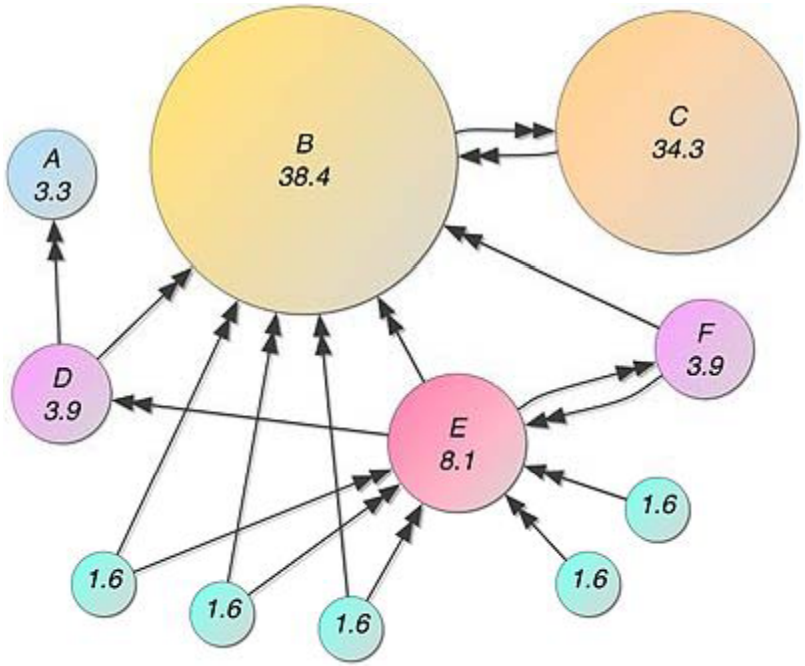


Königsberg bridge problem

House and Utility Problem



Page Rank Algorithm - Google



According to Google:

Page Rank works by counting the number and quality of links to a page to determine a rough estimate of how important the website is. The underlying assumption is that more important websites are likely to receive more links from other websites

https://en.wikipedia.org/wiki/PageRank

https://web.stanford.edu/class/cs54n/handouts/24-GooglePageRankAlgorithm.pdf

Thanks for your patience!