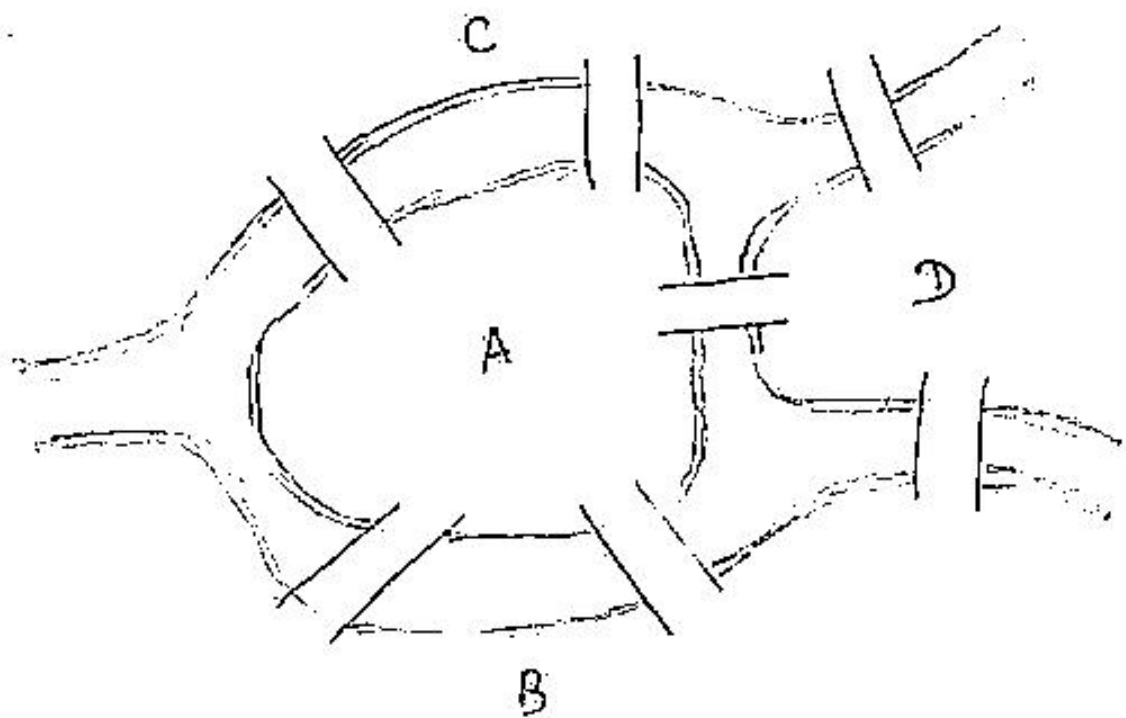


Graph theory

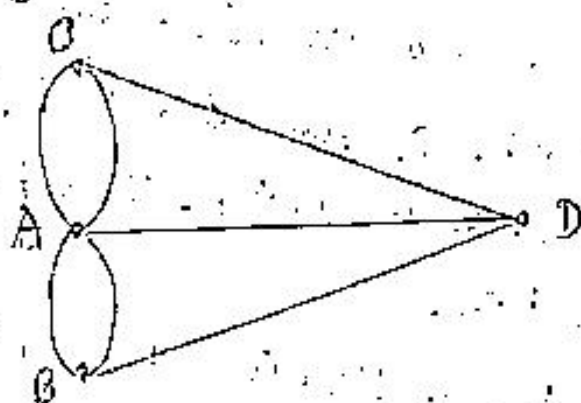
Introduction : Euler is known as the father of graph theory. Graph theory is considered to have begun in 1736 with the publication of Euler's solution of the Königsberg bridge problem. There were two islands linked to each other and to the banks of the Pregel River by seven bridges as shown in the following figure.



The problem was to begin at any of the four ~~land~~ land areas, then walk across each bridge exactly one and return to the starting point.

To ~~ally~~ solve this problem, Euler replaced each land area by a point and each bridge by a line.

joining the corresponding points. Therefore we get the following figure and that figure is the 'graph' of the Königsberg bridge problem.



Graph of Königsberg bridge problem.

Using this Euler ~~proved~~ that proved that the problem is unsolvable.

Graph: A graph G consists of a set of objects $V = \{v_1, v_2, v_3, \dots\}$ called vertices or points or nodes and other set $E = \{e_1, e_2, e_3, \dots\}$ whose elements are called edges or lines or arcs. i.e. a graph consists two sets, one is the vertex set and the other is the edge set. Usually a graph is denoted as $G = (V, E)$. A graph of 'p' points and 'q' lines is called a (p, q) graph.

Let G be a graph and $\{u, v\}$ is an edge of G .
 [an edge $\{u, v\}$ is also denoted as uv or vu]

Then we say that u and v are adjacent points in G and edge joins u and v . The point u and line uv are called incident to each other, as are v and uv . If two distinct lines are incident with a common point, then they are called adjacent lines.

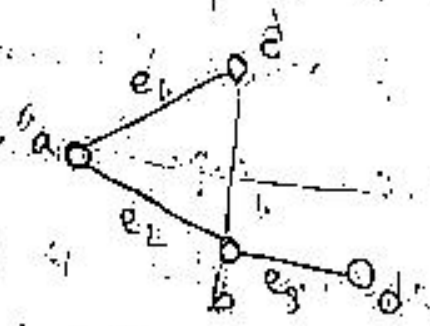
Let us consider the following Example:

Let $G = (V, E)$ is a graph defined by the sets,

$$V(G) = \{a, b, c, d\}$$

$$E(G) = \{ab, ac, bd\}$$

Now we have the following graph



Here a and c ; a and b ; b and d are adjacent points. Moreover e_1 and e_2 , e_2 and e_3 are adjacent lines.