



Isomorphism

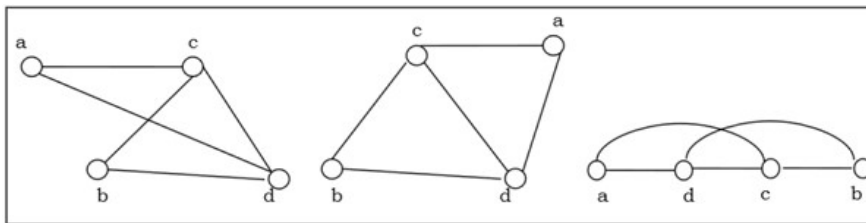
If two graphs G and H contain the same number of vertices connected in the same way, they are called isomorphic graphs (denoted by $G \cong H$).

It is easier to check non-isomorphism than isomorphism. If any of these following conditions occurs, then two graphs are non-isomorphic –

- The number of connected components are different
- Vertex-set cardinalities are different
- Edge-set cardinalities are different
- Degree sequences are different

Example

The following graphs are isomorphic –

**Homomorphism**

A homomorphism from a graph G to a graph H is a mapping (May not be a bijective mapping) $h: G \rightarrow H$ such that $(x, y) \in E(G) \rightarrow (h(x), h(y)) \in E(H)$. It maps adjacent vertices of graph G to the adjacent vertices of the graph H .

Properties of Homomorphisms

- A homomorphism is an isomorphism if it is a bijective mapping.
- Homomorphism always preserves edges and connectedness of a graph.
- The compositions of homomorphisms are also homomorphisms.
- To find out if there exists any homomorphic graph of another graph is a NP complete problem.