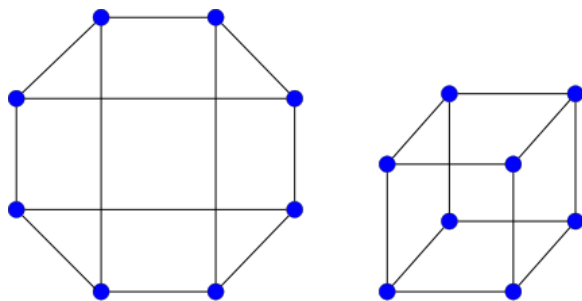
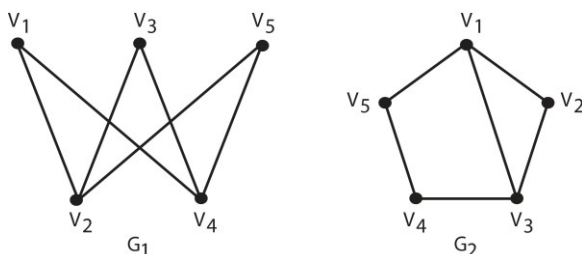


1. Show these two graphs are isomorphic:



2. Show these two graphs are not isomorphic:

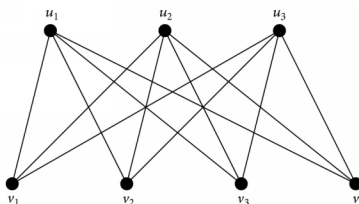


Bipartite Graphs

A graph G is *bipartite* if the set of vertices $VG = V_1 \cup V_2$ is a disjoint union of two sets V_1 and V_2 , and every edge $vw \in EG$ has $v \in V_1$ and $w \in V_2$. Equivalently, we can color the vertices of G either red or blue, so that each edge joins one red vertex to one blue vertex.

1. For which n is the cycle graph C_n bipartite?
2. For which n is the path graph P_n bipartite?
3. For which n is the complete graph K_n bipartite?
4. For which n is the cube graph Q_n bipartite?

The *complete bipartite graph* $K_{m,n}$ has vertex set $V_1 \cup V_2$ with $|V_1| = m$ and $|V_2| = n$. Edges join every vertex in V_1 with every vertex in V_2 . $K_{3,4}$ is shown below, with $V_1 = \{u_1, u_2, u_3\}$ and $V_2 = \{v_1, v_2, v_3, v_4\}$.



5. How many edges does $K_{m,n}$ have?