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 $V_G = V_1 \cup V_2$ is a disjoint union of two sets $V_1$ and $V_2$, and every edge $vw \in E_G$ 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?