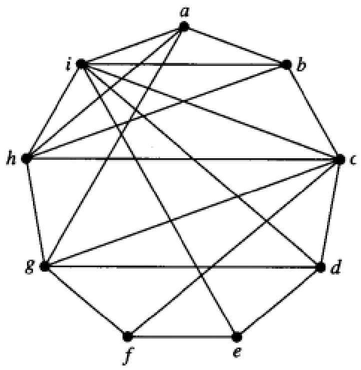
1. For which values of n do the following graphs have an Euler circuit? Explain why.

   (a) Kn (b) Cn (c) Wn (d) Qn

   A connected multigraph (or graph) has an Euler circuit iff each of its vertices has even degree.

   (a) Every vertex in Kn has degree n-1. Kn has an Euler circuit if n is odd.
   (b) Every vertex in Cn has degree 2. Cn has an Euler circuit for every n.
   (c) Every vertex except the center of Wn has degree three. Wn has an Euler circuit for no n.
   (d) Every vertex in Qn has degree n. Qn has an Euler circuit if n is even.

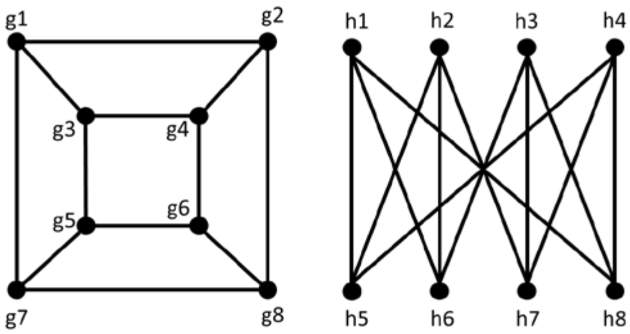
2. Find the chromatic number of the given graph.



   4

3. Check whether the following pairs of graphs are isomorphic. If they are, find the bijection between the vertex sets of G and H that $f = V(G) \rightarrow V(H)$

   (a)



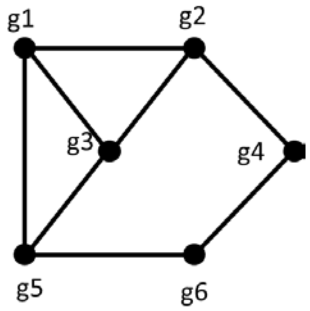
graph G graph H

Isomorphism.

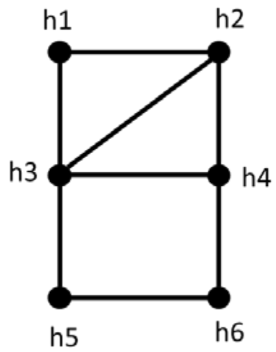
f(g1)=h1; f(g2)=h5; f(g3)=h6; f(g4)=h2;

f(g5)=h3; f(g6)=h7; f(g7)=h8; f(g8)=h4;

(b)



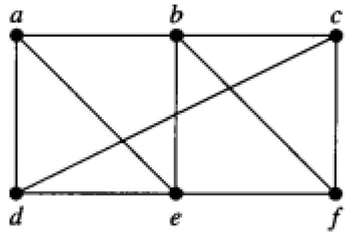
graph G



graph H

Not isomorphism.

4. Find the number of path between c and d of length 4.



Ans:

$$A = \begin{bmatrix} 0 & 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 & 1 & 0 \end{bmatrix} \quad A^2 = \begin{bmatrix} 3 & 1 & 2 & 1 & 2 & 2 \\ 1 & 4 & 1 & 3 & 2 & 2 \\ 2 & 1 & 3 & 0 & 3 & 1 \\ 1 & 3 & 0 & 3 & 1 & 2 \\ 2 & 2 & 3 & 1 & 4 & 1 \\ 2 & 2 & 1 & 2 & 1 & 3 \end{bmatrix} \quad A^3 = \begin{bmatrix} 4 & 9 & 4 & 7 & 7 & 5 \\ 9 & 6 & 9 & 4 & 10 & 7 \\ 4 & 9 & 2 & 8 & 4 & 7 \\ 7 & 4 & 8 & 2 & 9 & 4 \\ 7 & 10 & 4 & 9 & 6 & 9 \\ 5 & 7 & 7 & 4 & 9 & 4 \end{bmatrix}$$

$$A^4 = \begin{bmatrix} 23 & 20 & 21 & 15 & 25 & 20 \\ 20 & 35 & 17 & 28 & 26 & 25 \\ 21 & 17 & 24 & 10 & 28 & 15 \\ 15 & 28 & 10 & 24 & 17 & 21 \\ 25 & 26 & 28 & 17 & 35 & 20 \\ 20 & 25 & 15 & 21 & 20 & 23 \end{bmatrix}$$

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