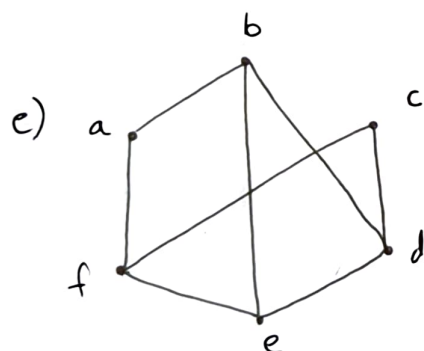
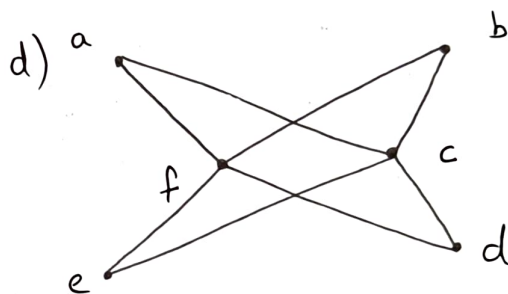
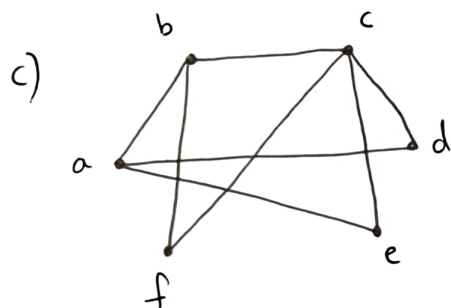
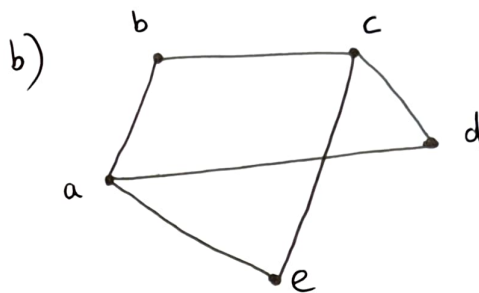
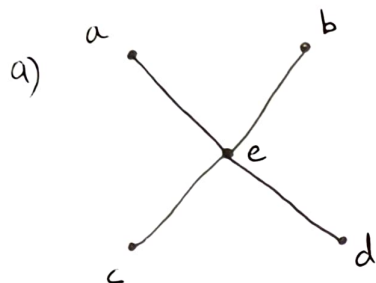


① Draw the following graphs:

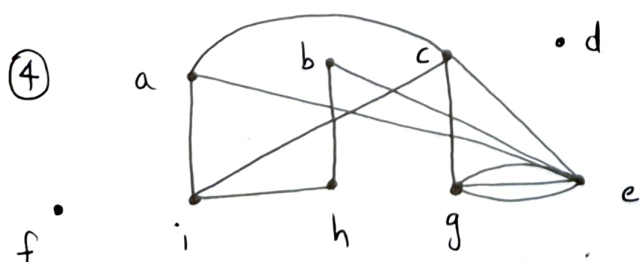
- a)  $K_7$     b)  $C_7$     c)  $K_{1,8}$     d)  $K_{4,4}$

② Determine whether the following graphs are bipartite or not



③ For what values of  $n$  are these graphs bipartite

- a)  $K_n$     b)  $C_n$     c)  $W_n$



Find a) the subgraph induced by vertices  $a, b, c$ , and  $f$ .

b) the new graph obtained by contracting the edge connecting  $b$  and  $f$ .

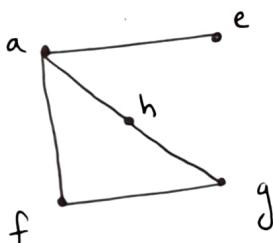
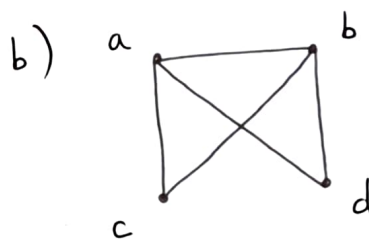
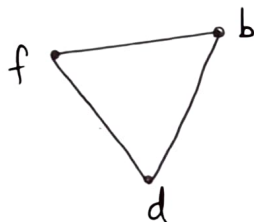
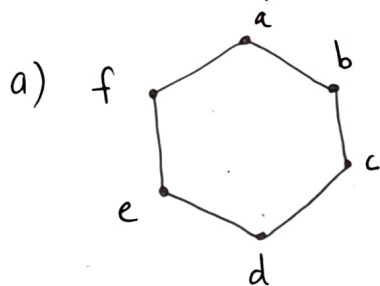
⑤ How many vertices and edges do these graphs have?

- a)  $K_n$     b)  $C_n$     c)  $W_n$     d)  $K_{m,n}$

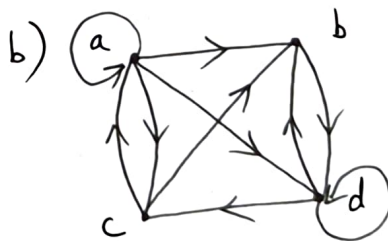
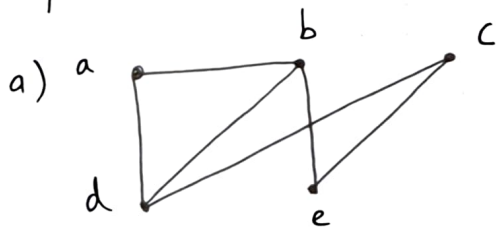
⑥ How many edges does a graph have if its degree sequence (degrees of vertices of the graph) is the following

- a) 4, 3, 3, 2, 2                      b) 5, 2, 2, 2, 2, 1

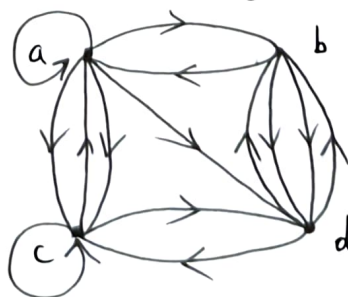
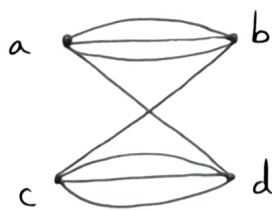
⑦ Find union of the following graphs



⑧ Represent the following using an adjacency list



⑨ Represent the following using adjacency matrix

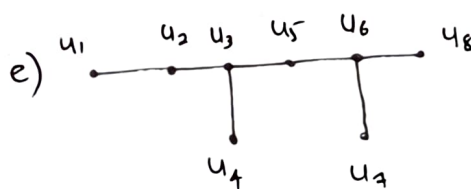
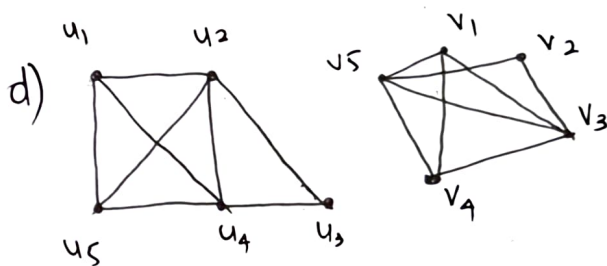
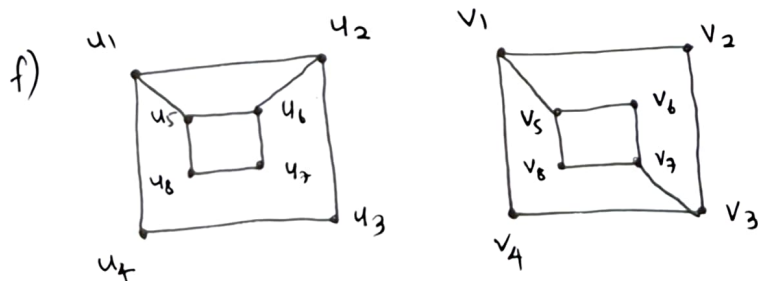
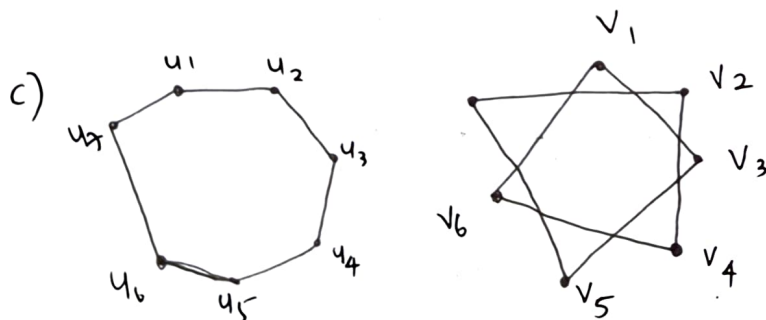
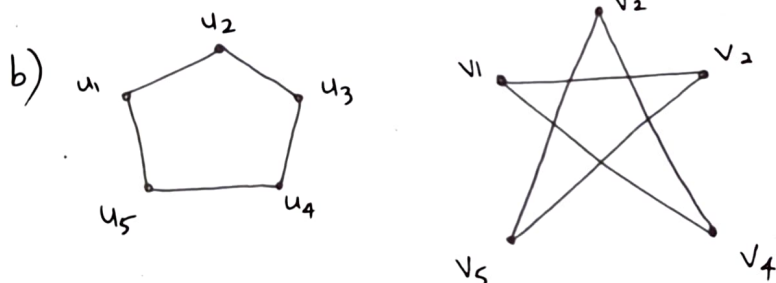
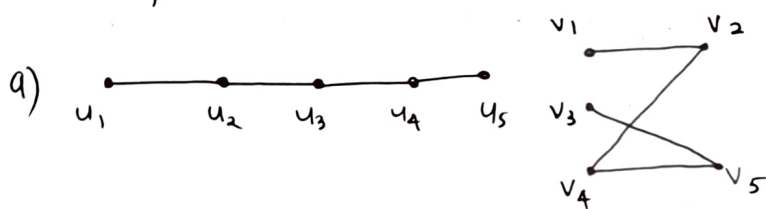


⑩ Draw the graph with the given adjacency matrix

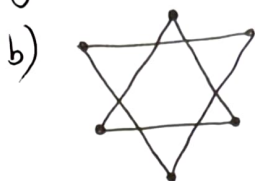
a) 
$$\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 \end{bmatrix}$$

b) 
$$\begin{bmatrix} 0 & 2 & 3 & 0 \\ 1 & 2 & 2 & 1 \\ 2 & 1 & 1 & 0 \\ 1 & 0 & 0 & 2 \end{bmatrix}$$

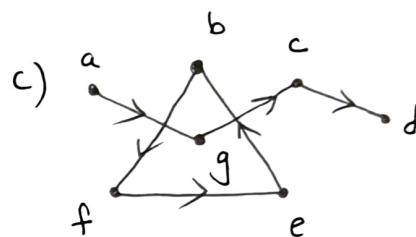
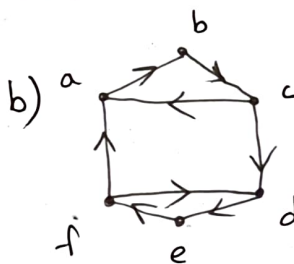
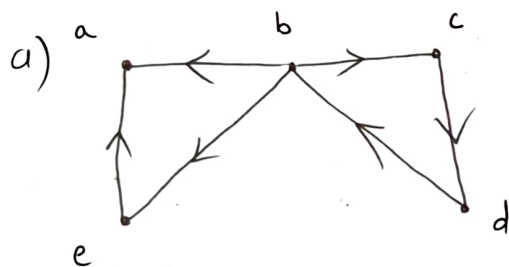
⑪ Determine whether the following are isomorphic. If yes, define the isomorphism and if no, explain why.



⑫ Which of the following graphs are connected?

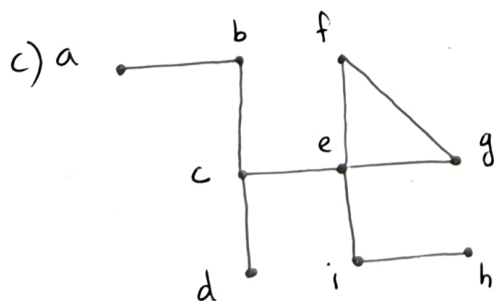
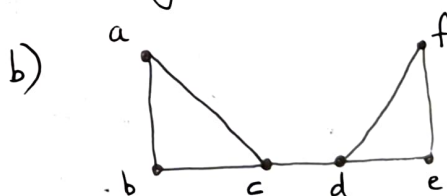
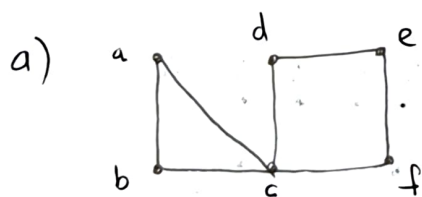


⑬ Determine which of the following are strongly connected. If not, whether it is weakly connected or not.

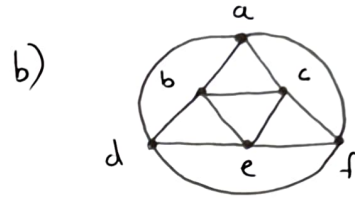
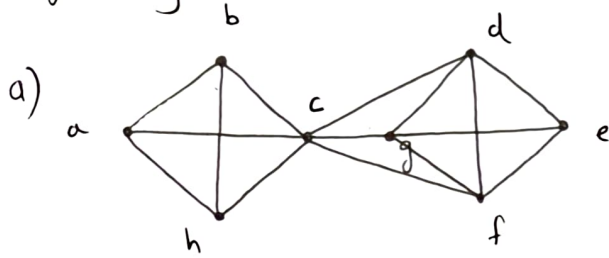


⑭ Find the number of paths of length 3 between two different vertices in  $K_4$ .

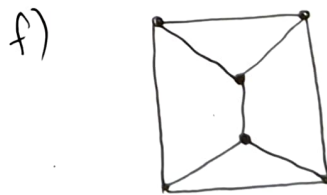
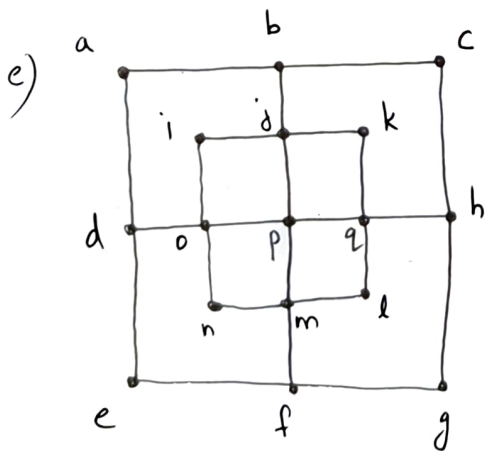
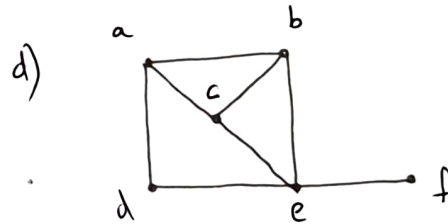
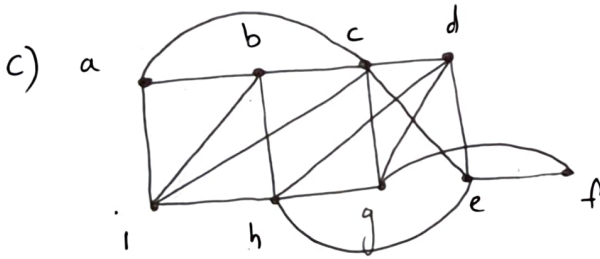
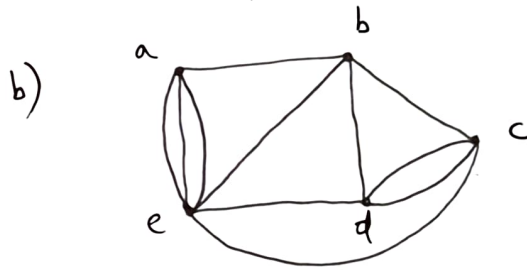
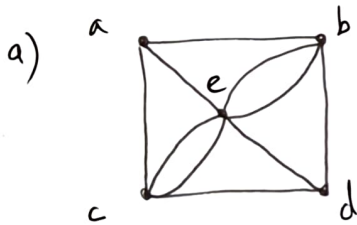
⑮ Find all the cut vertices and cut edges of the following graphs.



⑩ Find vertex connectivity,  $K(G)$  and edge connectivity,  $\lambda(G)$  for the following.



⑪ Determine whether the following has an Euler graph, Euler path, Hamiltonian circuit and Hamiltonian path.



18) Find the shortest path between a and z in the following

