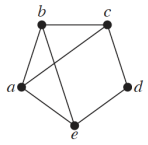
1. How many vertices and how many edges do these graphs have?
   (a) K_n
   (b) C_n
   (c) W_n
   (d) $K_{m,n}$
2. How many subgraphs with at least one vertex does W_3 have?

   A simple graph is called regular if every vertex of this graph has the same degree. A regular graph is called n-regular if every vertex in this graph has degree n.
3. For which values of n are these graphs regular?
   (a) K_n
   (b) C_n
   (c) W_n
4. For which values of m and n is $K_{m,n}$ regular?
5. How many vertices does a regular graph of degree four with 10 edges have?
6. The complementary graph $\bar{G}$ of a simple graph G has the same vertices as G. Two vertices are adjacent in $\bar{G}$ if and only if they are not adjacent in G. Describe each of these graphs.
   (a) $\overline{K_n}$
   (b) $\overline{K_{m,n}}$
   (c) $\overline{C_n}$
7. If G is a simple graph with 15 edges and $\bar{G}$ has 13 edges, how many vertices does G have?
8. Are the simple graphs with the following adjacency matrices isomorphic?
   (a) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$
   (b) $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$
   (c) $\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$
9. Determine whether the given graph has an Euler circuit. Construct such a circuit when one exists. If no Euler circuit exists, determine whether the graph has an Euler path and construct such a path if one exists.

1.



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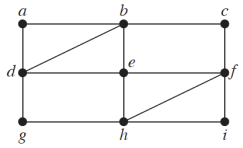

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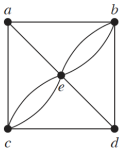

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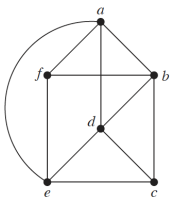

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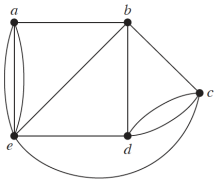
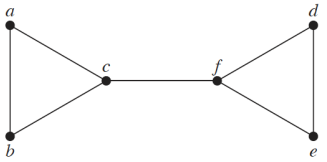
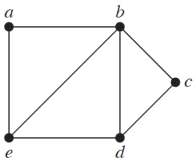


10. Determine whether the given graph has a Hamilton circuit. If it does, find such a circuit. If it does not, give an argument to show why no such circuit exists.





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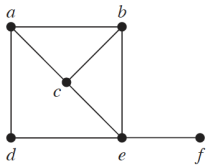
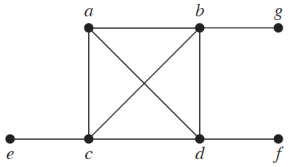
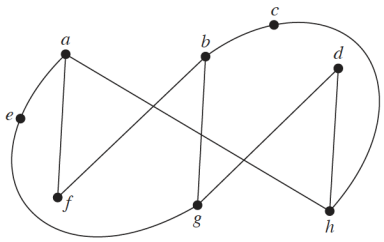
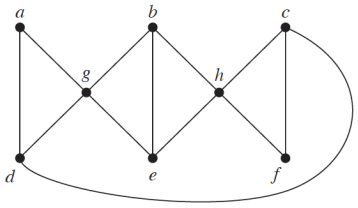
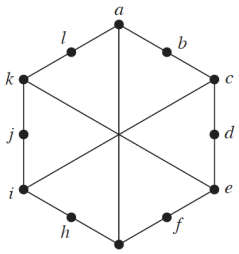




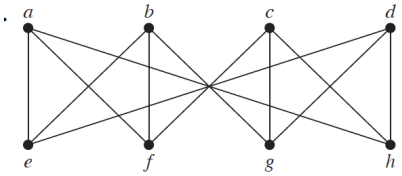
11. determine whether the given graph is homeomorphic to $K_{3,3}$.





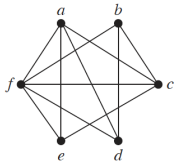


12. Use Kuratowski's theorem to determine whether the given graph is planar.



13. Determine whether the given graph is planar. If so, draw it so that no edges cross.

7.



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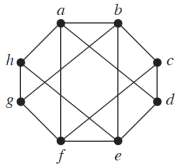

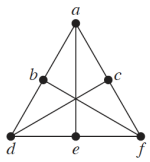

6.