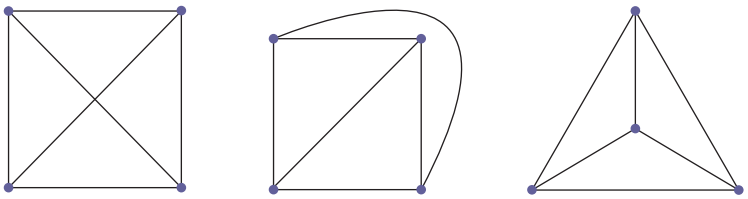
Chapter 14 Exercises

Solve each problem.

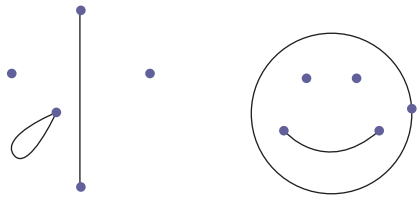
1. Draw a graph that has six vertices (v_1, v_2, v_3, v_4, v_5, v_6) and the edges v_1v_4, v_1v_5, v_1v_6, and v_2v_3. Is the graph connected?

2. Determine if the three graphs represent the same graph.



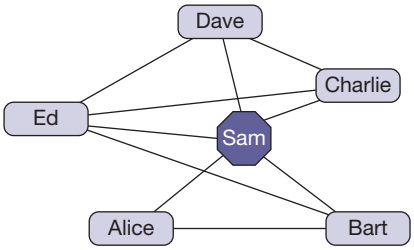
Graph *L* Graph *M* Graph *N*

3. Determine if the two graphs represent the same graph.



Graph *G* Graph *H*

4. Use the following graph to answer the questions below.



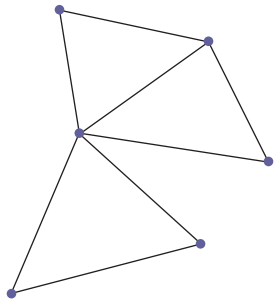
a. What is the degree of "Sam"?

b. Identify a path of length 5. If no such path exists explain why.

c. Identify a path of length 6. If no such path exists explain why.

d. Identify a cycle of length 5.

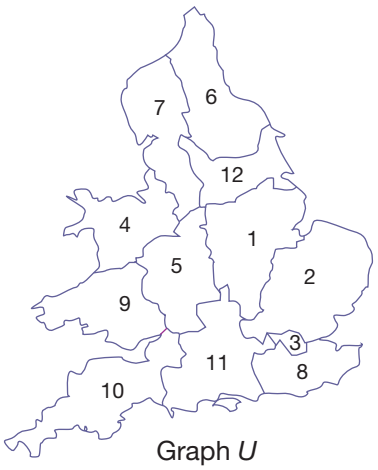
5. Find a vertex coloring of graph W. What is the chromatic number of that graph?



Graph W

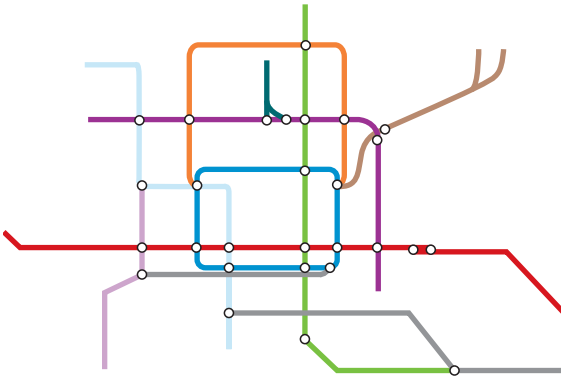
6. Use a vertex coloring to assign colors to the regional electricity companies in England and Wales so that companies whose regions share a border have different colors. What is the minimum number of colors required? Find a vertex coloring using the minimum number of colors.

Regional Electricity Companies in England and Wales

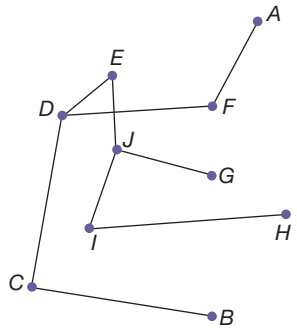


Graph U

7. Determine if the graph formed by the subway map is a tree.



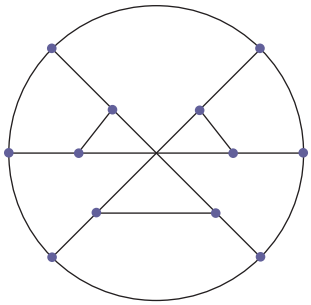
8. Determine whether the graph is a tree.



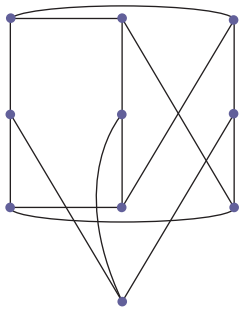
Graph *W*

Determine the number of edges needed to form a tree in each graph.

9.

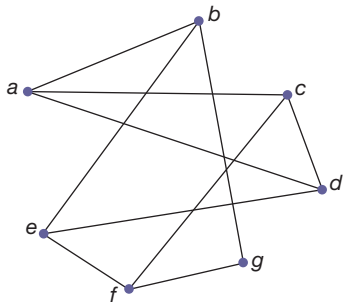


10.

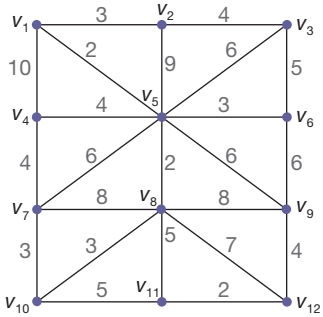


Solve each problem.

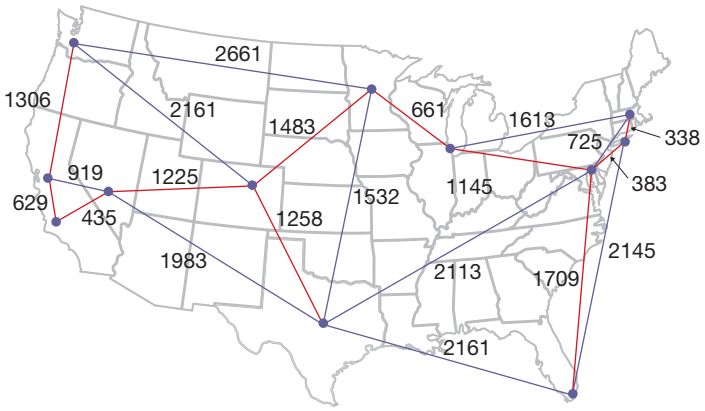
11. Find a spanning tree for the following graph.



12. Find a minimum-weight spanning tree in the following graph.



13. A national internet grid is needed to connect the cities in the following graph with optical fiber in the most cost-effective way possible. The weights on the edges represent the lengths of cable that would have to be used to connect each pair of cities, when that can be achieved.

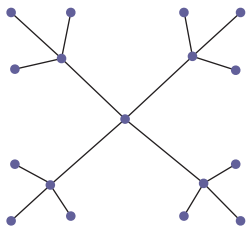


a. The proposed connections are represented by the red edges. Check that this graph is a spanning tree. Explain why a spanning tree is a suitable way to lay the optical fiber.

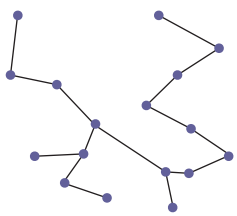
b. Is the proposed set of connections a minimum-weight spanning tree?

14. Find the number of leaves in the given trees.

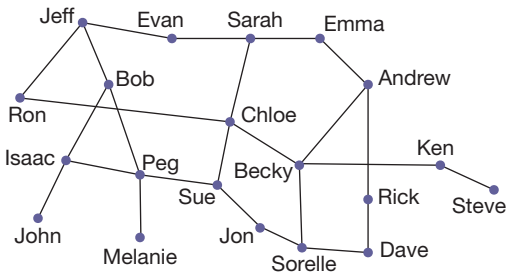
a.



b.



Use the given graph to identify the neighborhood of each set.

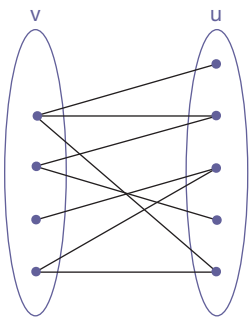


15. $A = \{\text{Bob, Evan}\}$

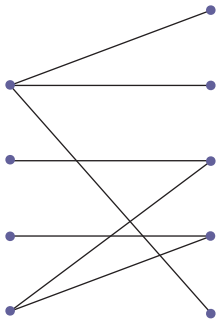
16. $A = \{\text{Sorelle, Peg, Evan}\}$

Determine if each graph has a matching. Justify your answer.

17.

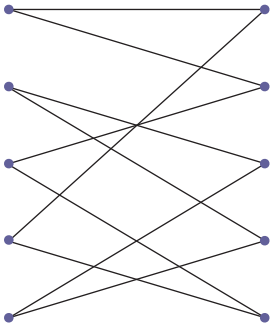


18.

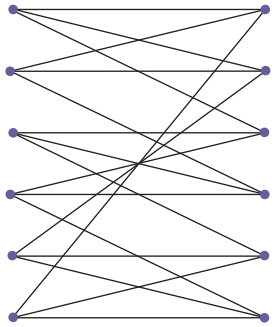


Find a matching in each regular bipartite graph.

19.

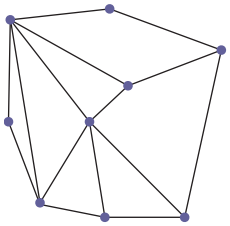


20.

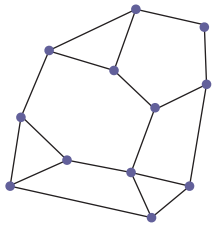


Determine the number of faces in each planar graph.

21.



22.

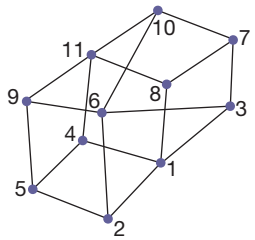


Solve the problem.

23. Verify Euler's formula for the graphs in Exercises 21 and 22.

Determine if each graph is planar.

24.



25.