2.1.6

In Exercises 2.1.1 through 2.1.6, find all possible isomorphism types of the given kind of simple graph.

2.1.**1**^{S} A 4-vertex tree.

2.1.**2** A 4-vertex connected graph.

2.1.**3** A 5-vertex tree.

2.1.**4** A 6-vertex tree.

2.1.**5** A 5-vertex graph with exactly three edges.

2.1.**6** A 6-vertex graph with exactly four edges.

2.1.14

In Exercises 2.1.11 through 2.1.14, find all possible isomorphism types of the given kind of general graph.

2.1.**11**^{S} A graph with two vertices and three edges.

2.1.**12** A graph with three vertices and two edges.

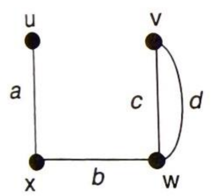
2.1.**13** A graph with three vertices and three edges.

2.1.**14** A 4-vertex graph with exactly four edges including exactly one self-loop and a multi-edge of size 2.

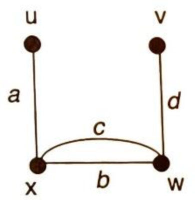
2.2.7

In Exercises 2.2.5 through 2.2.7, specify all the automorphisms of the given graph.

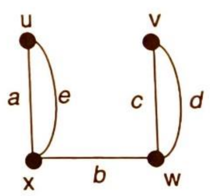
2.2.5^S



2.2.6



2.2.7



2.2.11

In Exercises 2.2.9 through 2.2.12, prove that the specified graph is vertex-transitive.

2.2.**9**^{S} K_n

2.2.**10** Q_n

2.2.**11** $circ(n : S)$

2.2.**12** The Petersen graph

2.2.25

In Exercises 2.2.18 through 2.2.27, find the vertex and edge orbits of the given graph.

2.2.**18**^{S} The graph of Exercise 2.2.1.

2.2.**19** The graph of Exercise 2.2.2.

2.2.**20** The graph of Exercise 2.2.3.

2.2.**21** The graph of Exercise 2.2.4.

2.2.**22** The graph of Exercise 2.2.5.

2.2.**23** The graph of Exercise 2.2.6.

2.2.**24** The graph of Exercise 2.2.7.

2.2.**25** The graph of Figure 2.2.9(a).

2.2.**26** The graph of Figure 2.2.9(b).

2.2.**27** The graph of Figure 2.2.9(c).

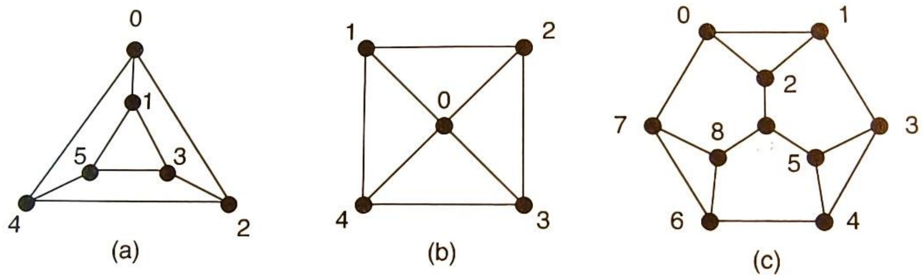
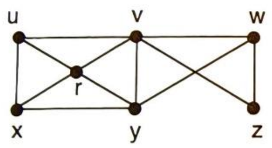


Figure 2.2.9 Three graphs with symmetries.

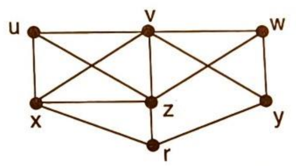
2.3.22

In Exercises 2.3.19 to 2.3.22, do all of the following. (a) Find all of the cliques in the given graph. (b) Give the clique number. (c) Find all the maximal independent sets. (d) Give the independence number. (e) Find the center.

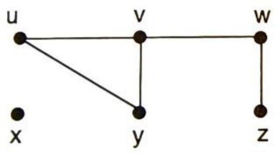
2.3.**19**$^{\mathbf{S}}$



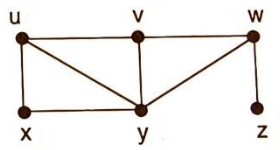
2.3.**20**



2.3.**21**



2.3.**22**



2.3.32

In Exercises 2.3.29 to 2.3.32, find all possible isomorphism types of the given kind of graph.

2.3.**29** A 6-vertex forest with exactly two components.

2.3.**30** A simple 4-vertex graph with exactly two components.

2.3.**31** A simple 5-vertex graph with exactly three components.

2.3.**32** A simple 6-vertex graph with exactly three components.

2.3.40

2.3.**40** Prove or disprove: For every subgraph H of any graph G, there exists an edge subset D such that $H = G(D)$.

2.3.41

2.3.**41** Let U and W be vertex subsets of a graph G. Under what conditions will $G(U) \cup G(W) = G(U \cup W)$?

2.4.19

In Exercises 2.4.16 through 2.4.19, determine the largest number of edges in a minimal edge-cut for the specified graph, and find one such edge-cut.

2.4.**16**[S] The graph of Exercise 2.4.8.

2.4.**17** The graph of Exercise 2.4.9.

2.4.**18** The graph of Exercise 2.4.10.

2.4.**19** The graph of Exercise 2.4.11.

2.4.27

2.4.**27** How would you recognize from the reconstruction deck of a graph whether it is connected? (Give a proof that your method works.)

2.4.33

2.4.**33** Draw a 5-vertex graph G that has no cut-edges and such that the suspension $G + v$ has exactly five cut-edges.

2.4.39

2.4.**39** Prove that no vertex of a graph G can be a cut-vertex of both G and $\overline{G}$.

2.5.11

Give isomorphism or explain why they are not isomorphic.

2.5.**11**

2.6.7 and list all length-3 walks from a to d.

In Exercises 2.6.7 and 2.6.8, draw a graph that has the given adjacency matrix.

2.6.**7**

$$A_G = \begin{array}{c} \\ a \\ b \\ c \\ d \end{array} \begin{array}{c} \begin{array}{cccc} a & b & c & d \end{array} \\ \begin{pmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{pmatrix} \end{array}$$

2.6.**8**

$$A_G = \begin{array}{c} \\ a \\ b \\ c \\ d \end{array} \begin{array}{c} \begin{array}{cccc} a & b & c & d \end{array} \\ \begin{pmatrix} 2 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{pmatrix} \end{array}$$

2.7.24

2.7.**24** It is possible to amalgamate $2C_4$ to $2C_4$ modulo an isomorphism into the circular ladder CL_4. Describe the subgraph of amalgamation.