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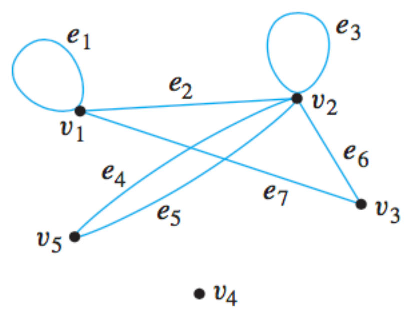
Reading: 625-638. Set 10.1 - #'s 9, 27.b, 44

For each of the graphs in 8 and 9:

(i) Find all edges that are incident on v_1.
(ii) Find all vertices that are adjacent to v_3.
(iii) Find all edges that are adjacent to e_1.
(iv) Find all loops.
(v) Find all parallel edges.
(vi) Find all isolated vertices.
(vii) Find the degree of v_3.
(viii) Find the total degree of the graph.

9.



i. e1, e2, e7
ii. v2, v1
iii. e2, e7
iv. e1, e3,
v. e4, e5
vi. v4
vii. degree = 2
viii.

v1 = 4
v2 = 6
v3 = 2
v4 = 0
v5 = 2

totdegree = 14

27. **a.** In a group of 15 people, is it possible for each person to have exactly 3 friends? Explain. (Assume that friendship is a symmetric relationship: If x is a friend of y, then y is a friend of x.)

b. In a group of 4 people, is it possible for each person to have exactly 3 friends? Why?

b. The answer is yes. Each of the 4 people represent a vertex and two vertices that are joined if and only if they are friends. Suppose they were friends with 3 others. The degree of each of the 4 people would be 3, and so the total degree of the graph would be 12. This properly represents corollary 10.1.2, which states that the total degree of the graph is even – as can be seen here.

44. a. In a simple graph, must every vertex have degree that is less than the number of vertices in the graph? Why?

b. Can there be a simple graph that has four vertices each of different degrees?

a. Yes, every vertex has a degree that is less than the number of vertices in the graph because a simple graph cannot loop. If it could loop, then it would be able to include itself. Since it cannot, at every vertex, there must be a degree that is one less than the number of vertices in the graph.
b. Yes, as long as the vertices are one less than the total number of vertexes on the graph.