Problem 2

Answer if the walks are trails, paths, closed walks, circuits, simple circuits, or just walks.

(a) $v1, e2, v2, e3, v3, e4, v4, e5, v2, e2, v1, e1, v0$

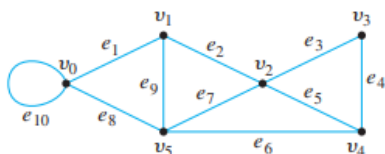(b) $v2, v3, v4, v5, v2$

(c) $v4, v2, v3, v4, v5, v2, v4$

(d) $v2, v1, v5, v2, v3, v4, v2$

(e) $v0, v5, v2, v3, v4, v2, v1$

(f) $v5, v4, v2, v1$

Answer (a): walk (edge $e2$ and vertices $v1, v2$ repeat not as first, last)

Answer (b): simple circuit (no edges repeat, vertex $v2$ repeats as first, last)

Answer (c): walk (vertices $v4, v2$ repeat but not only as first, last)

Answer (d): circuit (no repeat edge, vertex $v2$ starts, ends)

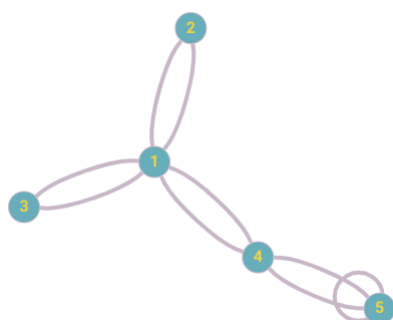**Answer (e):** trail (vertex $v2$ repeats but not edges)

Answer (f): path (no vertices repeat); trail (no edges repeat)

Problem 9c

Answer if the graph has a Euler circuit.

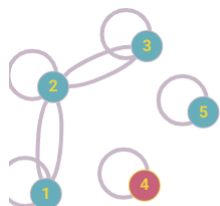**Graph:** Graph G has five vertices of degrees $2, 2, 4, 4$, and 6.

Answer: Not necessarily. The graph exists:

A Euler circuit is possible, with returns to vertices along parallel edges.

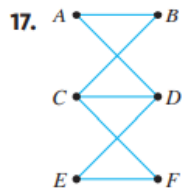$$1, 2, 1, 3, 1, 4, 5, 5 \text{ loop}, 4, 1$$

But the prompt doesn't necessitate a connect graph. An alternative also exists:

This graph has a Euler circuit with vertices 1, 2, and 3, but not one using every edge in the graph.

Problem 17

Answer if the graph has a Euler circuit. Describe it if yes, explain why if no.

Answer:
No, there isn't a Euler circuit.

Vertices C and D have odd degree 3, and graphs with odd-degree vertices don't have Euler circuits.
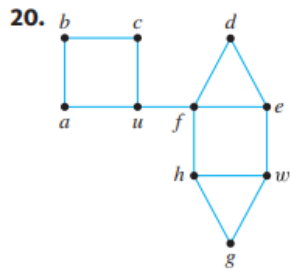
In an attempted Euler circuit:
$$A, D, E, F, C$$
If the edge C to D didn't exist, a Euler circuit could complete to B, then A.

However, a Euler circuit is impossible without traversing one edge twice.

Problem 20

Answer if there's a Euler trail from u to w. If yes, find the trail.
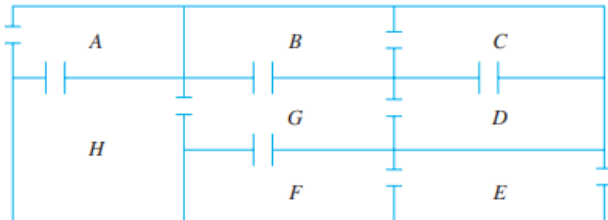

Answer:
No, there isn't a Euler trail.

Vertices u and w have odd degree, and the graph is connected, but h also has an odd degree of 3.

Problem 22

Given a home's floor plan, traverse every interior doorway once from rooms A to E.

Answer:

$$A, H, G, B, C, D, G, F, E$$