

Work on these with your partner(s) at the board

1. Let $G = (V, E)$ be the graph where $V = \{a, b, c, d\}$ and $E = \{\{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{a\}, \{c, d\}\}$
 - (a) Sketch G
 - (b) What is the degree of each vertex?
 - (c) What is the total degree of G ?
2. Sketch a graph with the specified properties or explain why no such graph exists.
 - (a) A graph with 4 vertices and 8 edges.
 - (b) A simple graph with 4 vertices and 3 edges.
 - (c) A non-simple graph with 4 vertices and 3 edges.
 - (d) A connected simple graph with 4 vertices and 3 edges.
 - (e) A simple graph with 4 vertices and 8 edges.
 - (f) K_5 , the complete graph with 5 vertices
3. Let $V = \{v_1, v_2, \dots, v_{10}\}$ and define an equivalence relation R on V by $v_i R v_j$ iff $i \equiv j \pmod{3}$. Sketch the digraph corresponding to this equivalence relation.
Problem Set #8 may be a useful reference.

4. Let $S = \{1, 2, 3, 4, 5\}$. Consider defining a graph G using the following process:
- Vertices: Each vertex of G corresponds to a different two-element subset of S
 - Edges: Two vertices are connected by an edge if their corresponding sets are disjoint
- (a) How many vertices does G have? List them.
- (b) Consider the vertex v_{12} corresponding to the set $\{1, 2\}$. Which vertices are adjacent to v_{12} ?
- (c) Sketch G
5. Find a walk on the graph below that contains every edge exactly once.

