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 $i \equiv j \mod 3$. Sketch the digraph corresponding to this equivalence relation.
   Problem Set #7 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.