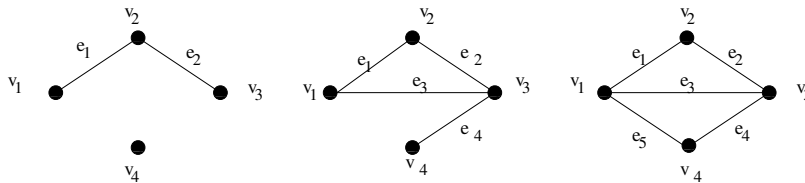


**CSC/MA/OR 565 - Spring 2018**  
**Homework 2**

1. Find a graph  $G$  with 5 vertices which has neither a clique of size 3 nor an independent set of size 3.
2. Find all isomorphism classes of simple graphs with 5 vertices and 5 edges.
3. Problem 1.1.18, text
4. Let  $A$  be the adjacency matrix of  $K_n$ . If  $i = j$ , then  $A^2[i, j] = \underline{\hspace{1cm}}$ . Otherwise  $A^2[i, j] = \underline{\hspace{1cm}}$ .
5. Prove or disprove: If  $G$  is a disconnected graph, then  $\overline{G}$ , the complement of  $G$ , is connected.
6. Problem 1.2.2, text
7. A graph is called *chordal* if it has no induced subgraph isomorphic to  $C_n$  for any  $n \geq 4$ . Which of the following 10-vertex graphs are chordal?

$K_{10}$ ;     $K_{5,5}$ ;     $K_{1,9}$ ;     $C_{10}$ ;     $P_{10}$ ;    the Petersen graph.

8. a. For each graph  $G$  below, find the incidence matrix  $M(G)$ . (See Definition 1.1.17 and Example 1.1.19.)



- b. Recall that the transpose of a  $p \times q$  matrix  $M$  is the  $q \times p$  matrix  $M^T$  with  $M^T[i, j] = M[j, i]$ . For each graph  $G$  above in (a), find the matrix product  $M(G) \cdot (M(G))^T$ .