

Assignment #18: Section 6.1/ 1,2,5,9,13,30,49,50,51,65,71

1. Give the function  $g$  that is part of the formal definition of the directed graph shown.

$$g(a) = (1,2)$$

$$g(b) = (1,3)$$

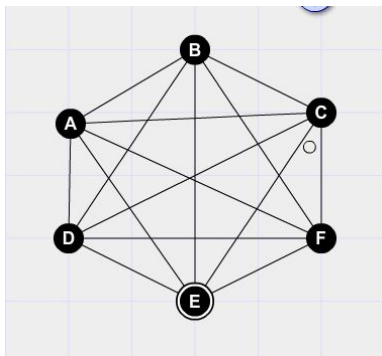
$$g(c) = (2,3)$$

$$g(d) = (2,2)$$

2. Use the graph in the figure to answer the questions that follow.

- a) Is the graph simple?
  - a. The graph is simple.
- b) Is the graph complete?
  - a. The graph is not complete.
- c) Is the graph connected?
  - a. The graph is connected.
- d) Can you find two paths from 3 to 6?
  - a.  $3 \rightarrow 4 \rightarrow 5 \rightarrow 6$  and  $3 \rightarrow 5 \rightarrow 6$
- e) Can you find a cycle?
  - a.  $3 \rightarrow 4 \rightarrow 5 \rightarrow 3$
- f) Can you find an arc whose removal will make the graph acyclic?
  - a.  $A_5$
- g) Can you find an arc whose removal will make the graph not connected?
  - a.  $A_1$

5. Draw  $K_6$



9. An acquaintanceship graph is an undirected graph in which the nodes represent people and nodes  $a$  and  $b$  are adjacent if  $a$  and  $b$  are acquainted.

- a) No one from the IT department knows anyone in the marketing department. Same as with the marketing department not knowing anyone in IT.
- b) Carl and Fletcher are not acquainted. SiuYin is acquainted with only Carl.
- c) The degree of separation between Carl and Yuri is 2.

13. WOTF graphs is not isomorphic to the others, and why?

a) (b) is not isomorphic to (a) and (c) because there is not an isolated node.

30. If all the nodes of a simple, connected, planar graph have degree 4 and the number of arcs is 12, in how many regions does the it divide the plane?

a) 8 regions

49. Describe the graph whose adjacency matrix is  $I_n$ , the  $n \times n$  identity matrix.

a) The graph consists of isolated nodes that loop itself.

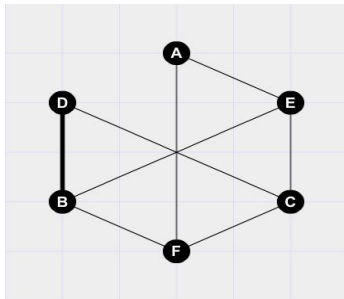
50. Describe the graph whose adjacency matrix is  $O_n$ , the  $n \times n$  matrix of all 0's.

a) The graph consists of nodes with no edges.

51. Describe the adjacency matrix for  $K_n$ , the simple, complete graph with  $n$  nodes.

a) The adjacency matrix for  $K_n$  consist of 1's with a diagonal of 0's stretching from the top-left to bottom-right.

65. Draw  $G'$  for the graph of Fig 6.18a.



71. Given an adjacency matrix  $A$  for a simple graph  $G$ , describe the adjacency matrix for  $G'$ .

a) The matrix of  $G'$  will be the inverse of matrix  $A$  where the 1's in  $\text{mat}A$  will be 0's and the 0's will become 1's