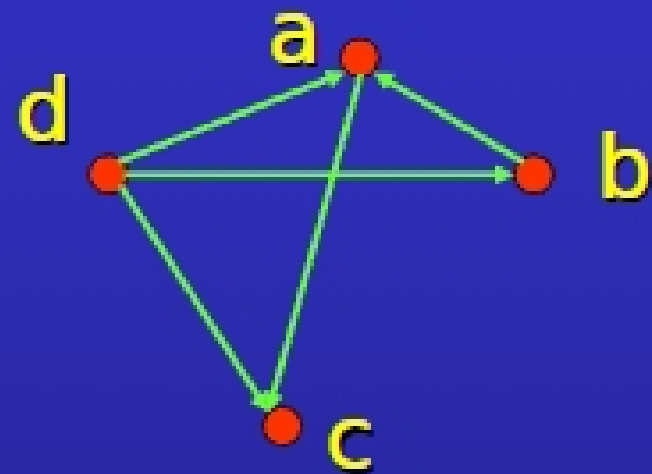
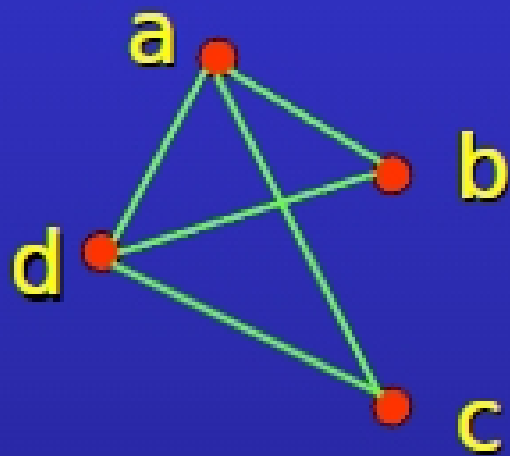


# **Representing Graphs and Graph Isomorphism (Chapter 9.3)**

## **Connectivity (Chapter 9.4)**

Based on slides by Y. Peng  
University of Maryland

# Representing Graphs



| Vertex | Adjacent Vertices |
|--------|-------------------|
| a      | b, c, d           |
| b      | a, d              |
| c      | a, d              |
| d      | a, b, c           |

| Initial Vertex | Terminal Vertices |
|----------------|-------------------|
| a              | c                 |
| b              | a                 |
| c              |                   |
| d              | a, b, c           |

# Representing Graphs

**Definition:** Let  $G = (V, E)$  be a simple graph with  $|V| = n$ . Suppose that the vertices of  $G$  are listed in arbitrary order as  $v_1, v_2, \dots, v_n$ .

The **adjacency matrix**  $A$  (or  $A_G$ ) of  $G$ , with respect to this listing of the vertices, is the  $n \times n$  zero-one matrix with 1 as its  $(i, j)$  entry when  $v_i$  and  $v_j$  are adjacent, and 0 otherwise.

In other words, for an adjacency matrix  $A = [a_{ij}]$ ,

$a_{ij} = 1$       if  $\{v_i, v_j\}$  is an edge of  $G$ ,

$a_{ij} = 0$       otherwise.