**Graphs Worksheet**

1. Draw a simple, undirected graph that has 12 vertices, 18 edges, and 3 connected components. Why would it be impossible to draw G with 3 connected components if G had 66 edges?
2. Draw the adjacency list and adjacency matrix representation of the undirected graph shown in the Figure below:
 
3. Let G be a graph whose vertices are the integers 1 through 8, and let the adjacent vertices of each vertex be given by the table below:

|  |  |
| --- | --- |
| **Vertex** | **Adjacent Vertices** |
| 1 | (2, 3, 4) |
| 2 | (1, 3, 4) |
| 3 | (1, 2, 4) |
| 4 | (1, 2, 3, 6) |
| 5 | (6, 7, 8) |
| 6 | (4, 5, 7) |
| 7 | (5, 6, 8) |
| 8 | (5, 7) |

Assume that in a traversal of G, the adjacent vertices of a given vertex are returned in the same order as listed in the table above.

1. Draw G.
2. Give the sequence of vertices of G visited during a DFS traversal starting at vertex 1.
3. Give the sequence of vertices of G visited during a BFS traversal starting at vertex 1.
4. Explain why the DFS traversal runs in O(n2) time on an n-vertex simple graph that is represented with the adjacency matrix structure.
5. Draw a simple, connected, weighted graph with 8 vertices and 16 edges each with unique edge weights. Identify one vertex as a “start” vertex and illustrate a running of Dijkstra’s algorithm on this graph.
6. Draw a simple, connected, undirected, weighted graph with 8 vertices and 16 edges each with unique edge weights. Identify one vertex as a “start” vertex and illustrate a running of Kruskal’s algorithm on this graph.
7. A simple, undirected graph is complete if it contains an edge between every pair of distinct vertices. What does a depth first search tree of a complete graph look like?