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COMP 1805

Assignment 3

1.

A) This graph is not simple. Vertex 2 needs to connect to 5 vertexes but only 4 exist; in order for it to both be a degree 5 vertex and a simple graph. Therefore, it's impossible for vertex 2 to be in a simple graph, as it must connect to itself or to another vertex twice to have 5 edges for its degree value.

B) This graph is simple, example:
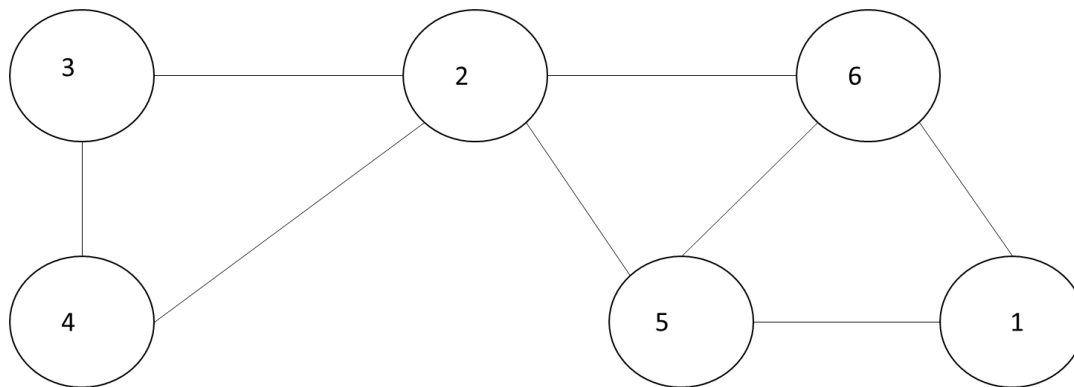
2.

V is a set of nodes (vertices)

E is the set of edges (lines between vertices)

Every edge is the graph is a pair of vertices, thus element E is a pair of vertices, V.

V = {1, 2, 3, 4, 5, 6, 7, 8}

E = {{1,5}, {5,6}, {6,8}, {7,8}, {3,8}, {3, 6}, {2,8}, {3, 5}, {4, 5}, {2, 4}}

3. Adjacency matrix:

	1	2	3	4	5	6	7	8
1	0	0	0	0	1	0	0	0
2	0	0	0	1	0	0	0	1
3	0	0	0	0	1	1	0	1
4	0	1	0	0	1	0	0	0
5	1	0	1	1	0	1	0	0
6	0	0	1	0	1	0	0	1
7	0	0	0	0	0	0	0	1
8	0	1	1	0	0	1	1	0

4. Adjacency list:

Initial vertex	Adjacent vertices
1	5

2	4,8
3	5,6,8
4	5,2
5	6,1,4,3
6	5,3,8
7	8
8	6,3,7,2

5.

V' = {1, 2, 3, 4, 5, 6, 7, 8}

E' = {(1, 5), (2, 8), (3, 6), (3, 8), (4, 2), (5, 3), (5, 4), (5, 6), (6, 8), (8, 7)}

6.

$K_3 = V'' = \{3, 6, 8\}$

E'' = {{3, 6}, {6, 8}, {3, 8}}

Adjacency matrix (every point connects to every other point):

	3	6	8
3	0	1	1
6	1	0	1
8	1	1	0

7.

E''' = {{2, 6}, {6, 4}}

|E'''| = 2

8.

Result: 1 → 0 → 2 → 4 → 6 → 9 → 3 → 5 → 7 → 8

V' = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}

E' = {{1, 0}, {1, 4}, {1, 2}, {0, 6}, {2, 5}, {2, 3}, {2, 7}, {0, 9}, {9, 8}}

Adjacency list:

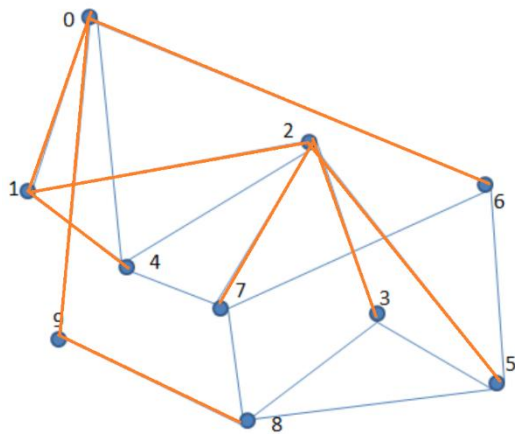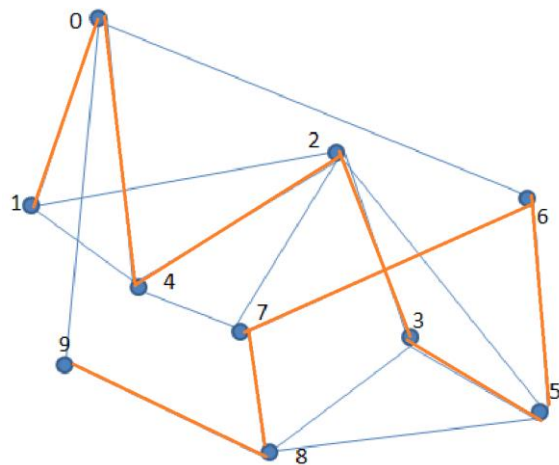| Initial vertex	Adjacent vertices
0	1, 9, 6
1	0, 2, 4
2	1, 7, 3, 5
3	2
4	1
5	2
6	0
7	2
8	9
9	0, 8

9.

result: $1 \rightarrow 0 \rightarrow 4 \rightarrow 2 \rightarrow 3 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$

V' = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}

E' = {{1, 0}, {0, 4}, {4, 2}, {2, 3}, {3, 5}, {5, 6}, {6, 7}, {7, 8}, {8, 9}}

Adjacency matrix:

	0	1	2	3	4	5	6	7	8	9
0	0	1	0	0	1	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0
2	0	0	0	1	1	0	0	0	0	0
3	0	0	1	0	0	1	0	0	0	0
4	1	0	1	0	0	0	0	0	0	0
5	0	0	0	1	0	0	1	0	0	0
6	0	0	0	0	0	1	0	1	0	0
7	0	0	0	0	0	0	1	0	1	0
8	0	0	0	0	0	0	0	1	0	1
9	0	0	0	0	0	0	0	0	1	0