CS5200 Homework 3 Graphs
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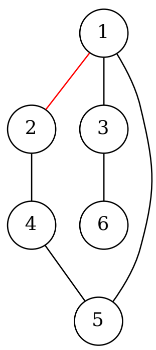
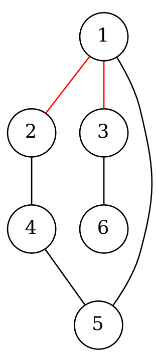
Question 1)

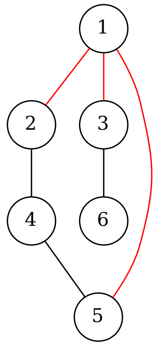
Initialize n sets where n is the number of nodes and each set contains one of the nodes. Then for each edge in the graph there are two possibilities for the connected nodes.
1) The nodes are in different sets
Then union the two set together and remove the odd sets
2) The nodes are in the same set
Then there is a cycle in the graph
If you run out of edges without finding a cycle there is no cycle in the graph



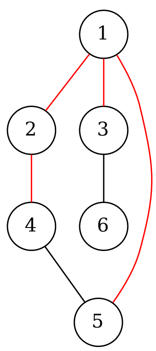
{1, 2} {3} {4} {5} {6}



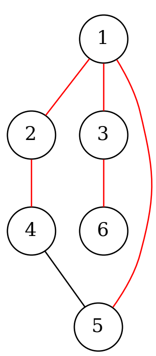
{1, 2, 3} {4} {5} {6}



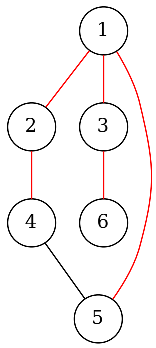
{1, 2, 3, 5} {4} {6}



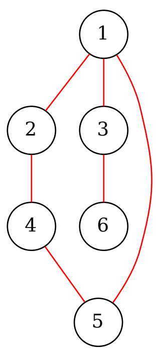
{1, 2, 3, 4, 5} {6}



{1, 2, 3, 4, 5} {6}



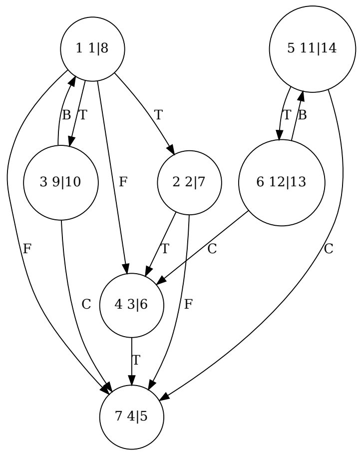
{1, 2, 3, 4, 5, 6}



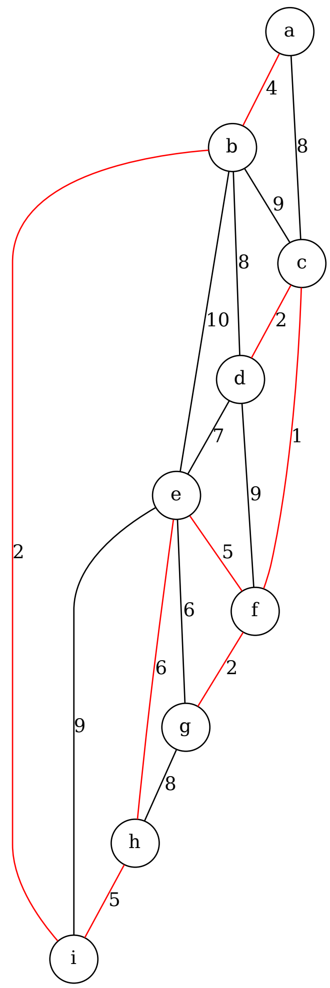
{1, 2, 3, 4, 5, 6}

Since 4 and 5 are already in the same set there is a cycle in the graph.

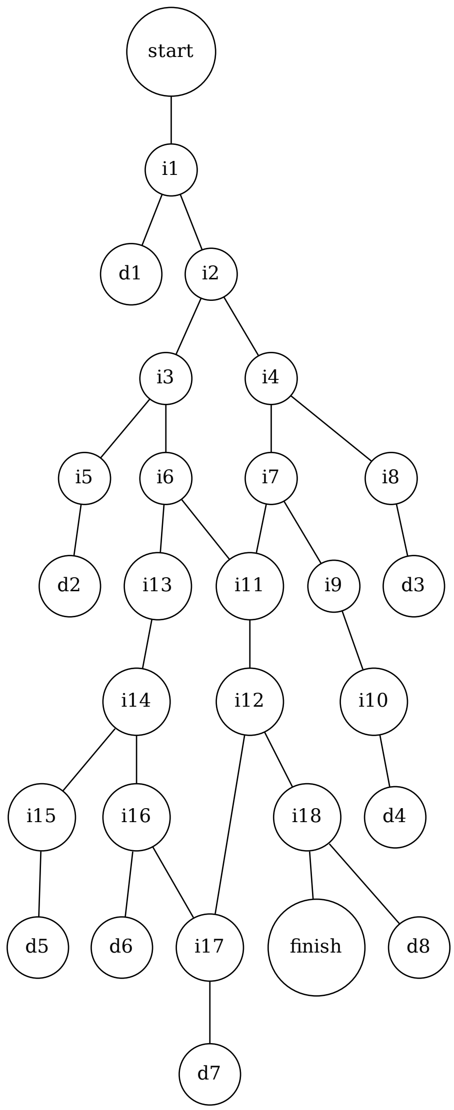
2)



3)



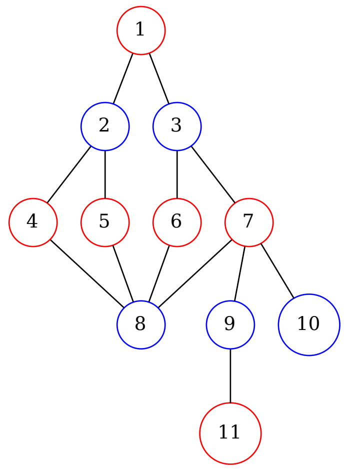
Kruskal's algorithm
Join order: c-f, c-d, b-i, f-g, a-b, e-f, h-i, e-h
Prim's algorithm
Join order: a-b, b-i, i-h, h-e, e-f, c-f, c-d, f-g
4)



A DFS would be better in this case because we are not looking for the shortest path but only a path. The DFS would return the first path that it found even if it was not the shortest path, but the BFS would be guaranteed to find the shortest path.

Bonus:
A bipartite graph cannot have a cycle with an odd number of edges. This is equivalent to saying the nodes of the graph can be colored with two colors with

no connected nodes being colored the same color. The following graph is a bi-



partite graph.