CS271: Data Structures 45/50

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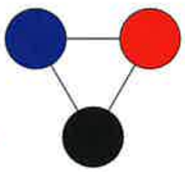
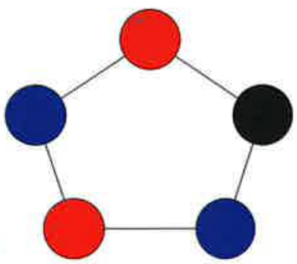
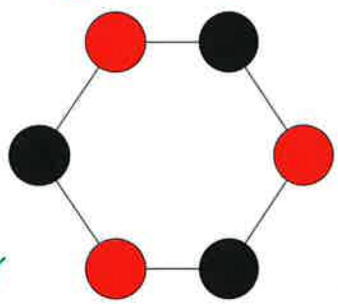
Project #7: Applied

Applied

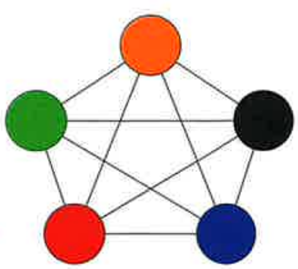
1. Consider each of the following graphs. Show a proper coloring of each using only the chromatic number of colors

   (a)  Chromatic number: 3

   (b)  Chromatic number: 3

   (c)  Chromatic number: 2

2. Coloring of cliques

   (a)  Chromatic number: 5

   (b) If a graph $G = (V, E)$ and G is a clique then $|V|$ is equal to G's chromatic number.

3. Design a linear time algorithm to determine whether an undirected graph G is bipartite.

Algorithm 1 (Helper function) Use DFS traversal to checks for adjacent nodes of the same color, returning false. Otherwise, return true

```
procedure BIPARTITE-DFS(G.Adj, s, color)
    for each v in G.Adj[s] do
        if color[v] == −1 then
            color[v] = 1 − color[s]
            if BIPARTITE-DFS(G.Adj, v, color) == false then
                return false
            end if
        else if color[v] == color[s] then
            return false
        end if
    end for
    return true
end procedure
```

mixing vertices and indices in here

Algorithm 2 Returns true if an undirected graph G containing n vertices is bipartite. Otherwise, return false

```
procedure IS-BIPARTITE(G.Adj, n)
    color = [−1] ∗ n // Let color be an array of size n initialized with −1
    for i to n − 1 do
        if color[i] == −1 then
            color[i] = 1
            if BIPARTITE-DFS(i, G.Adj, color) == false then
                return false
            end if
        end if
    end for
    return true
end procedure
```

4. The chromatic number of colors of an undirected graph with exactly one odd-length cycle is 3.