1.
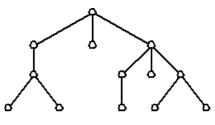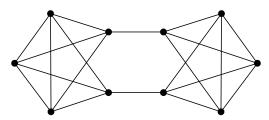
a) Label the vertices of the following tree with the numbers $1, 2, 3, \ldots$ in the order of breadth-first search.

b) Label the vertices of the following tree with the numbers $1, 2, 3, \ldots$ in the order of depth-first search.

2.

a) Determine the chromatic number of the following graph.

b) Find a perfect matching in the graph.

3. A connected graph G is given. Prove that there exists a closed walk in G which visits every edge of G exactly *twice.*