1. Design a linear time algorithm that takes an undirected graph $G = (V, E)$ and determines whether two points $u, v \in V$ are in the same component.

2. (3.11) Design a linear time algorithm that takes an undirected graph $G = (V, E)$ and a particular edge $e \in E$ and determines whether G has a cycle containing e.

3. Give a linear time algorithm to determine whether an undirected graph $G = (V, E)$ is fully connected.

4. Give a $O(|V| \log |V|)$ time algorithm to determine whether an undirected, fully connected graph contains a cycle.

5. Give a $O(|V| \log |V|)$ time algorithm to determine whether an undirected graph is actually a tree.