MTH 4320 Homework 4

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February 29, 2024

Problem 1

solution. The edges of the breadth-first search (BFS) tree of the graph G starting from root g are $e_1 = \{g, b\}, e_2 = \{g, i\}, e_3 = \{g, j\}, e_4 = \{b, a\}, e_5 = \{b, c\}, e_6 = \{i, d\}, e_7 = \{i, f\}, e_8 = \{j, e\}, e_9 = \{j, h\}$ in the order from first to last respectively, that which was to be demonstrated. ■

Problem 2

solution. The algorithm is a modified BFS.

1. Let the vertex of every squirrel be the root of a BFS tree.
2. Run the modified BFS for every squirrel to find all vertices that each root can reach using at most 5 edges.
3. If there is a common vertex in the BFS trees of all five squirrels then return true else return false.

This is a modified BFS alogrithm so we need to visit every vertex and edge that are necessary to check. Visiting all vertices takes $O(|V|)$ time, visiting all edges takes $O(|E|)$ time, and all other operations takes $O(1)$ time. Therefore, the running time is $O(|V| + |E|)$. ■