Assignment Four

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1 Asymptotic Run Time

1. DFS [$O(V + E)$]
   - V is the number of vertices and E is the number of edges. With each vertex being traversed twice (once not met and once upon traversal) the same is true for edges. Edges also have the added feature of being traversed an additional time since edges can be traversed in both direction. Once on it's way to target and once more on the return. Ultimately, it comes down to vertices being added(traversals) and edges with theirs. This results in the above time complexity.

2. BFS [$O(V + E)$]
   - BFS shares similarities with DFS in the sense every vertex and edge must be traversed. The biggest difference being the approach. Since BFS leans on spanning the surface (keeping track) of nodes it would likely become less efficient if the graph is big enough.

3. BTS [AVG: $O(logn)$, WORST:$O(n)$]
   - Worst case can be explained if the target being searched is deeply embedded in the tree. It would require a straight line where N is the number of nodes. If the tree is perfectly symmetrical on the both sides, time complexity becomes $O(logn)$. Just like binary search and/or quicksort, the tree leans heavily on the search being split in half which reduces time to search. The above average case is akin to previous algorithms as it utilizes the similar principles.