Discrete Structures (CSCI 246)

Homework 4 — Bonus

Recall that a binary tree T is either:

1. `null` (the empty tree), or
2. a root node r with two binary trees T_ℓ and T_r as its left and right subtrees.

Prove **by structural induction** that for every binary tree T, `countLeaves`(T), defined below, returns the number of leaves of T.

Algorithm 1 `countLeaves`(T)

```
1: if T is null then
2:     return 0
3: else
4:     Let T_ℓ, T_r be the left and right subtrees of T
5:     if T_ℓ, T_r both null then
6:         return 1
7:     else
8:         return countLeaves(T_ℓ) + countLeaves(T_r)
```