

COMP 7712: Assignment 1
Due date: 09/06/2016

1. The binary tree data structure has two attributes **left** and **right**, indicating the left and right subtrees. If a node has no left (or right) subtree, **left** (or **right**) is NIL. The depth of a binary tree is the longest number of steps (distance) from the root to a leaf. For example, the binary tree below has depth 3. (A longest distance is from the root to the node 5).

Use mathematical induction to explain that the Depth algorithm correctly computes the depth of a binary tree.

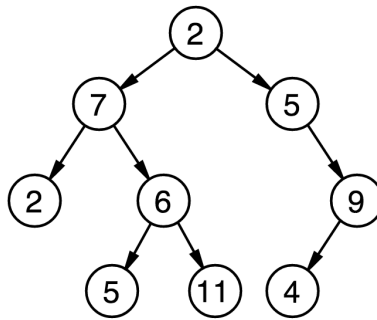


Figure 1: A binary tree with height of 3.

```
1. DEPTH(T)
2.   if T == NIL then
3.     return -1
4.   if T.left == NIL and T.right == NIL then
5.     return 0
6.   return 1 + max( Depth(T.left), Depth(T.right) )
```

2. A palindrome is a string that is the same as its reverse. For example, “abba” is a palindrome. Use mathematical induction to prove that the algorithm Palindrome correctly determines if an input string s is a palindrome.

```
1. PALINDROME(s)
2.   if len(s) <= 1 then
3.     return True
   return s[0] == s[len(s) - 1] and PALINDROME(s[1 : len(s) - 1])
```
