1. Which of the following statements about binary trees is **NOT** true?

A. Every node has at most two children.
B. Every non-empty tree has exactly one root node.
C. Every non-root node has exactly one parent.
D. [Correct Answer] [Your Answer] Every binary tree has at least one node.
E. A node can have no children.

2. Choose the appropriate running time from the list below.

The variable *n* represents the number of items (keys, data, or key/data pairs) in the structure. In answering this question you should assume the best possible implementation given the constraints, and also assume that every array is sufficiently large to handle all items (unless otherwise stated).

Perform an In-order traversal of a Binary Tree.

A. $O(n^2)$
B. $O(1)$
C. $O(n\log n)$
D. [Correct Answer] [Your Answer] $O(n)$
E. $O(\log n)$

3. Choose the appropriate running time from the list below.

The variable *n* represents the number of items (keys, data, or key/data pairs) in the tree and *h* represents the height of the tree. In answering this question you should assume the best possible implementation given the constraints, and also assume that every array is sufficiently large to handle all items (unless otherwise stated).

Find all nodes at distance 3 from the root. Assume that the height of the tree is much larger than 3.

A. $O(n)$
B. $O(n^2)$
C. None of the options is correct
D. [Correct Answer] [Your Answer] $O(1)$
E. $O(h)$

4. Given a `binary search tree`, which traversal type would print the values in the nodes in sorted order?

A. The answer cannot be determined from the information given.
B. [Correct Answer] [Your Answer] In-order
C. Post-order
D. None of these is the correct response.
E. Pre-order

5. Consider the binary tree class described in lecture where we have 1) variable `root` that is the `treeNode` representing the root of the binary tree and 2) each `treeNode` consists of an integer `data` element, and two `treeNode` pointers called `left` and `right`.

What does fun(`root`) return?

```
int fun(treeNode *
curr) {    if (curr !=
null) {        ret1 =
fun(curr->left);
ret2 =
fun(curr->right);
      return curr->data + ret1 + ret2;
   }
   else return 0;
}
```

A. `fun` returns the shortest distance from root to leaf.
B. [Correct Answer] [Your Answer] `fun` returns the sum of all elements in the tree.
C. None of the other options is correct.
D. `fun` returns the number of elements in the tree.
E. `fun` returns the height of the tree.

Processing math: 100%