CSCE-629 Homework 6

Wang, Han-Yi
wanghy917@email.tamu.edu

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Exercise 12.1-2

For each node x in a binary-search-tree. If y is a node in the left subtree, then $y.key \leq x.key$. If y is in the right subtree, then $y.key \geq x.key$. Differently, for each node x in a min-heap, $x.key \geq y.key$ for all y in its left and right subtree.

For a min-heap with n nodes, we can get the minimum value in $O(1)$. However, the min-heap needs to heaplify again, and it takes $O(lg(n-1)$ time. Therefore, the time complexity to print out the keys of a $n-$node tree in a sorted order is $\sum_{i=0}^{n-1} O(lg(i)) + O(1) \leq O(nlg(n))$.

Exercise 12.2-5

Given a node in a binary searcch tree.

- The successor is the node with minimum key in its right subtree, it has no left child according to the TREE-MINIMUM algorithm.
- The predecessor is the node with maximum key in its left subtree, it has no right child according to the TREE-MAXIMUM algorithm.

Algorithm 1 TREE-MINIMUM(x)

```
1 while x.left ≠ NIL
2     x = x.left
  return x
```

Algorithm 2 TREE-MAXIMUM(x)

```
1 while x.right ≠ NIL
2     x = x.right
  return x
```