(a) What is the difference between $O(1)$ and $O(n)$?

(b) List two methods that are part of the List interface that are not part of the Collection interface.

(c) Describe two ways to automatically lose 50% on a lab assignment.

(a) Implement the indexOf method for the LinkedList class we have been developing in lecture. Recall that the class has two attributes: Node<E> head and Node<E> tail where Node<E> is an inner class with two attributes: E value and Node next and two constructors: Node(E value) and Node(E value, Node next).

(b) Give the Big-O time complexity for the following method when a LinkedList of size n is passed as an argument. Justify your answer.

```
public static int sum(List<Integer> numbers) {
  int sum = 0;
  for(int i=0; i<numbers.size(); ++i) {
    sum += numbers.get(i);
  }
  return sum;
}
```

Recall that the PureStack<E> interface had four methods: peek(), pop(), push(), and isEmpty(). Using a LinkedList<E> for the internal data structure, show the complete implementation of the Stack<E> class that implements the PureStack<E> interface.

(a) What data type is stored in the Queue used in lab 5?

(b) What does each element in the Queue represent?

(c) The following classes are part of the lab 5 assignment. Circle the classes that are already implemented for you:

- Guitar
- Lab5
- Note
- SimpleAudio

Recall that our BinarySearchTree class had an inner, Node, class that contained three attributes: value, lKid, and rKid.

(a) Implement the recursive version of the BinarySearchTree.size() method that is called by the non-recursive method below.

```
public int size() {
    return size(root);
}
```

(b) Implement the recursive version of the BinarySearchTree.max() method is called by the non-recursive method below. The method below returns the largest value in the tree or `null` if the tree is empty.

```
public E max() {
    return root==null ? null : max(root);
}
```

(a) Using the BinarySearchTree.add() method developed in lecture, draw the tree after the following elements are entered in the order shown: 8, 3, 2, 10, 300

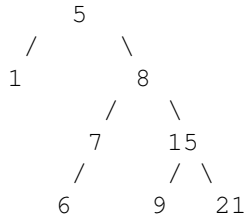
(b) List the order in with the elements in the above tree will be visited using the In Order traversal technique.

(c) List the order in with the elements in the above tree will be visited using the Pre Order traversal technique.

(a) Describe how the Set interface differs from the Collection interface.

(b) Describe how the Map interface differs from the Set interface.

(a) Write the AVL balance factor next to each node, and indicate which node(s) violate the properties of an AVL tree.



(b) Draw the tree shown in part (a) after left rotate has been performed on the node containing 8.