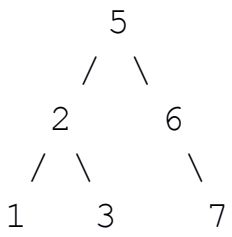
Name:_____ Lab Section:_____

Quiz 4C – November 22

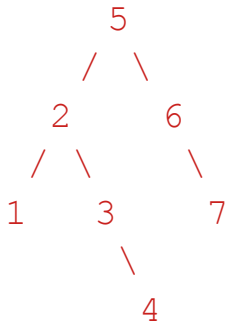
CS 2102 B19

1. (3 points) Imaging we have the following binary search tree (BST):



Draw the BST that results after we add 4 to the above BST.

One possibility:



Rubric:

3 points all or nothing. The BST must be valid, must include the 4, and must include all of the numbers from the original BST. The BST does not need to be an AVL tree.

2. (2 points) What is the Big-O of getting the minimum value from a heap? Briefly explain how you know.

O(1). This is because the minimum value will always be at the root, meaning it takes the same amount of time to retrieve it regardless of the size of the heap.

Rubric:

+1 O(1)

+1 Proper explanation

3. (5 points) Alter the code below to improve encapsulation. You do not need to rewrite all of the code. You are free to cross things out and to draw arrows to show your changes.

```
class Enterprise {

	private String captain;
	private EngineRoom er;

	//constructor omitted to save space

	public String makeItSo() {
		String s = "Ensign, increase warp by 1”;
		this.er.increaseWarpByOne();
		return s;
	}
}
class EngineRoom {

	private String chiefEngineer;
	private int currentWarp;

	//constructor omitted to save space

	public void increaseWarpByOne() {
		this.er.currentWarp++;
	}
}
```

Rubric:
+2 for setting all fields to private (-0.5 for each one missed)
+2 for correct method that increases `currentWarp`
-1 if method not in `EngineRoom` class
-0.5 if return value not specified or incorrect
-0.5 if parameter not empty (although acceptable if they make a method that takes in an int parameter, and they call the method with a value of 1)
-0.5 if method is not public
+1 method called inside `makeItSo()` instead of `currentWarp` field being changed directly
-2 if student provides (correct) written explanations instead of writing code
Do not deduct points for syntax errors or extra (i.e. unnecessary) code.