# CS221: Data Structures Homework - Heaps

### See Canvas for Due dates. Assume all of the heaps are intended to be Max Heaps.

## Problem 1:

Consider the heap tree shown below. Show how the node values would be stored in an array implementation of the heap (draw it):



## Problem 2:

Consider the tree shown below. Explain why it is not a heap.

It is not a heap because a heap bust be comprised of full heaps. The root with the index of 1 has no children, while the root with an index two has one. This is illegal as heaps are populated from left to right.

## Problem 3:

Consider the tree shown below. Explain why it is not a heap.

This is not a heap because the elements are out of order. In a minheap, the leaves of a root would have to be larger than their root, and in a maxheap, the opposite would be true. Because neither of these is the case, this is not a heap.

## Problem 4: Consider the Heap shown below. Show how the tree is restructured after the max node (root) is removed.

The value in the Red bubble is still in the array, but will be overwritten if we add any more data