1. [10 pts]. **Consider the array A = ⟨5, 13, 2, 25, 7, 17, 20, 8, 4⟩.**

(a) Perform HEAPSORT on array A, using the process illustrated in figure bleow as a model. Show the array after each iteration of the HEAPSORT algorithm, indicating the relevant changes during the sorting process.

HeapSort($A[1 \ldots n]$)

BuildHeap(A)
repeat $(n - 1)$ times:
swap $A[1]$ and $A[size]$
$size \leftarrow size - 1$
SiftDown(1)

2. [5 pts] For the set of {1,4,5,10,16,17,21} of keys, draw binary search trees of heights 2, 3, 4, 5, and 6

3. [4 pts] Given an array whose: address is 1000, element size is 8, first index is 0. What is the address of the element at index 6?

4. [6 pts] Suppose we perform a sequence of n operations on a data structure in which the ith operation costs i if i is an exact power of 2, and 1 otherwise. Use aggregate analysis to determine the amortized cost per operation.