CS 560 - HW 4: Heaps and Heapsort

Question 1

Q 1a:

Given a binary heap with the following set of values: [15, 12, 9, 7, 6, 10], can you provide the parent, left child, and right child indices for each value in the set, and explain how you obtained these indices?

Q 1b:

Related to Exercise 6.1-6: Consider the following four sets of values:

[25, 18, 12, 10, 6, 7]

[10, 8, 7, 6, 5, 4]

[20, 15, 18, 12, 13, 11]

[5, 7, 10, 12, 15, 18]

For each set, determine whether it is a max-heap, a min-heap, or neither a max-heap nor a min-heap, and explain your reasoning.

Question 2:

Related to CLRS Exercise 6.2-2: Write a Python function **min_heapify(arr, i)** that takes a list **arr** representing a binary tree and an index **i** as inputs, and modifies **arr** so that it represents a min-heap with the value at index **i** satisfying the min-heap property. Assume that the left and right subtrees of index **i** are already min-heaps. Do not use any helper functions to access the left child index, right child index, or parent index of a given index **i**. Instead, use basic arithmetic to compute these indices.

Question 3:

CLRS Exercise 6.4-3: What is the running time of HEAPSORT on an array A of length n that is already sorted in increasing order? What about decreasing order? Explain with an example.