1 Introduction and Objective

Welcome back from recess week =). I hope you are a bit fresher now (regardless of your Midterm Test scores). In this tutorial, we will first do a debrief of the Midterm Test that was conducted about 1.5 weeks ago and elaborate the thinking process on how to derive the required solutions and/or alternative solutions (if any) :O. Your tutor will discuss the typical common mistakes and share with you the thinking process to answer certain questions in a better (shorter) ways. Hopefully everybody will get his/her own closures after this.

We will then resume our discussion on Binary Heap data structure. Please review https://visualgo.net/en/heap again.

2 Tutorial 05 Questions

Midterm Test Debrief

Q1). The tutor will spend $\approx 20$ minutes to discuss this paper.

More Binary Heap Stuffs

Q2). Give an algorithm to find all vertices bigger than some value $x$ in a max heap that runs in $O(k)$ time where $k$ is the number of vertices in the output.

This is a new algorithm analysis type for most of you as the time complexity of the algorithm does not depends on the input size $n$ but rather the output size $k$ :O...

Note that this question has also been integrated in VisuAlgo Online Quiz, so it may appear in future Online Quizzes :).
Q3). The second largest element in a max heap with more than two elements (to simplify this question, you can assume that all elements are unique) is always one of the children of the root. Is this true? If yes, show a simple proof. Otherwise, show a counter example.

Note that this kind of (simple) proof will appear in CS2010 written tests, so please refresh your CS1231 knowledge.

Problem Set 3

Q4). We will end the tutorial with (early) discussion of (seemingly hard but actually easy) PS3. This single PS3 contains two interesting features of Binary Heap data structure that are not available in C++ STL priority_queue yet.