Instructions:

- Collaboration is permitted, but you must write the solutions by yourself without assistance, and be ready to explain them orally to a member of the course staff if asked. You must also identify your collaborators. Getting solutions from outside sources such as the Web or students not enrolled in the class is strictly forbidden.

- For problems that require you to provide an algorithm, you must give a precise description of the algorithm, together with a proof of correctness and an analysis of its running time. You may use algorithms from class as subroutines. You may also use any facts that we proved in class.

- Check the late policy from course Web page.

1. (Recurrences) Solve the following recurrence relations:
   
   (a) $T(n) = 7T(n/7) + n$
   (b) $T(n) = 8T(n/2) + n^3$
   (c) $T(n) = T(\sqrt{n}) + 1$

2. (Median-finding) Chapter 5, problem 1.

3. (Fraud detection) Chapter 5, problem 3.


   Note that a node can have at most three neighbors (i.e., its parent and two children). Assume that from any node, you can access these neighbors in constant time. As part of the problem, you are given the root of the tree.