1. Suppose a binary tree has leaves $l_1, l_2, \ldots, l_m$ at depth $d_1, d_2, \ldots, d_m$, respectively. Prove that $\sum_{i=1}^{m} 2^{-d_i} \leq 1$ and determine when the equality is true.

2. CLRS 12-4

3. CLRS 13.1-6 (p. 277) Justify your answers!

4. Kinda like CLRS 13.4-7:
   A. Does inserting a node into a red-black tree and then deleting it always result in the original tree? Prove it does or give a counterexample.
   B. Does deleting a leaf node from a red-black tree and then re-inserting the same key always result in the original tree? Prove it does or give a counterexample.

5. CLRS 13.3-5 (p. 287).

6. CLRS 13.3-6 (p. 287).