Introduction To Algorithms
CS430

FALL 2015
HomeWork 1
Due 31st August

1. Egg-Drop. Given 2 eggs and a device to hold the egg, determine the highest floor of a building of N floors from which the egg will survive the fall. Your method should require the least number of tests. Note that if you have one egg then the only way is to go up the building one floor at a time.

   (20 pts)

2. What is the smallest value of n such that an algorithm, whose running time is $200n^2$, runs faster than an algorithm whose running time is 1.5^n on the same machine.

   (10pts)

3. Consider the function $\hat{O}$ defined as follows:

   $f(n) = \hat{O}(g(n)$ iff there exists a positive constant, c and an integer n_0 such that

   $$0 \le f(n) \le cg(n) \log n \,, \quad \forall n \ge n_0$$

   Prove or Disprove

   (a) $f(n) = \hat{O}(g(n))$ implies $g(n) = \hat{O}(f(n))$.

   (b) $f(n) = \hat{O}(g(n))$ implies $\log f(n) = \hat{O}(\log g(n))$.

   Also prove or disprove:

   (c) $f(n) + o(f(n)) = \Theta(f(n))$.

   (d) $f(n) + g(n) = \Theta(\min(f(n), g(n)))$.

   (20 pts)