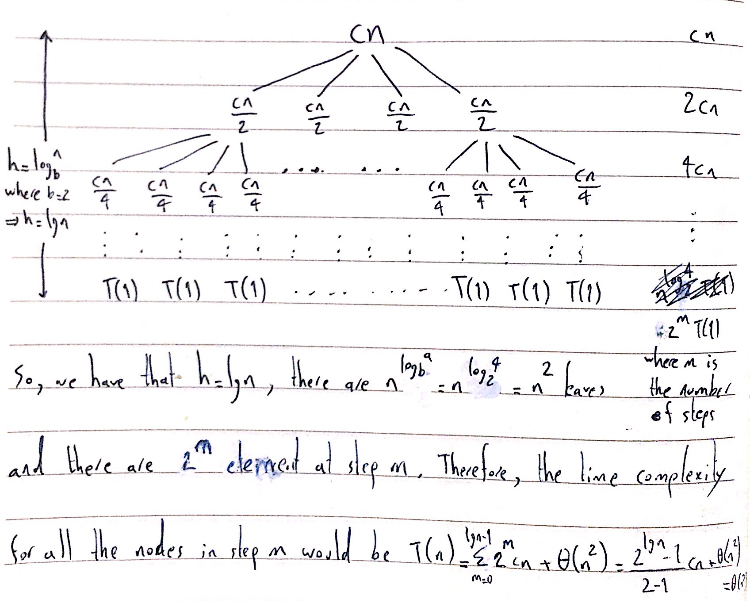
**HW - Week 11**

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4.4-7)



Hence, given T(n) = Θ(n2), we have that the upper bound is O(n2) and the lower bound is Ω(n2). Accordingly, we use substitution to provide the tightness of these asymptotic bounds (prove that this guess , which states T(n) = O(n2) as the upper bound, is correct). Therefore, using given constants d and e>0, we get that

Where >c. Therefore, the upper bound is T(n) = O(n2). Accordingly, for the lower bound, we want to prove that T(n) = Ω(n2). Hence, for a given constant d>0, we have

Where -4d+c≥4. This proves that the lower bound is T(n) = Ω(n2).

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B) For this recurrence a = 1, b= 10/7, and f(n) = n. Therefore, we have that

Since f(n)=, where and af(n/b) = f(7n/10) ≤ cf(n) where c= 7/10 < 1, by the case 3 of master theorem the solution is T(n) = Θ(f(n))= Θ(n).

C) For this recurrence a = 16, b= 4, and f(n) = n2. Therefore, we have that

Since f(n)=Θ(), then by the case 2 of master theorem the solution is T(n) = Θ() = Θ().

D) For this recurrence a = 7, b= 3, and f(n) = n2. Therefore, we have that

Since f(n)=Θ(), where and af(n/b) =7 f(n/3) ≤ cf(n) where c= 7/9 < 1, by the case 3 of master theorem the solution is T(n) = Θ(f(n))= Θ(n2).

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B) The worst-case running times for each strategy is provided respectively below:

1. T(n) = 2T(n/2) + Θ(n) so a=2, b=2, and f(n) = Θ(n). Therefore, we have that

Since f(n) =Θ(), by case 2 of the master theorem the solution is T(n) = Θ() = Θ().

1. T(n) = 2T(n/2) + Θ(N) = 4T(n/4) + 2Θ(N) + Θ(N) = .
2. T(n) = 2T(n/2) + Θ(n) so similar to part 1, by case 2 of the master theorem we have that T(n) = Θ() = Θ().