ECSE210L: Design and Analysis of Algorithms

Tutorial 3 (Week 3: January, 20 - 27, 2020)

Instructors: **Shakti Sharma and Raghunath Reddy M**

1. Show that the solution of $T(n) = T(n-1) + n$ is $O(n^2)$ using substitution method.

2. Show that the solution of $T(n) = 4T(n/3) + n$ is $O(n^{\log_3 4})$ using substitution method.

3. Show that the solution of $T(n) = T(n/3) + T(2n/3) + O(n)$ is $O(n \log n)$ using substitution method.

4. Find the solution of $T(n) = 2T(n-1) + 1$ by using recursion tree and verify your answer by using substitution method.

5. Find the solution of $T(n) = 4T(\lfloor n/2 \rfloor) + cn$ by using recursion tree and verify your answer by using substitution method.

6. Use Master theorem to find the solution of the following recurrence relations if possible. Otherwise, indicate that the Master theorem does not apply.

   a) $T(n) = 4T(n/2) + n^2$

   b) $T(n) = 2T(n/4) + \sqrt{n}$

   c) $T(n) = T(n/2) + 2^n$

   d) $T(n) = 2T(n/2) + n \log n$

   e) $T(n) = 3T(n/2) + n$

   f) $T(n) = 3T(n/3) + n$

   g) $T(n) = 0.5T(n/2) + 1/n$

   h) $T(n) = 2T(n/4) + n^2$

   i) $T(n) = 3T(n/4) + n \log n$

   j) $T(n) = T(7n/10) + n$

   k) $T(n) = 2^n T(n/2) + n^n$

   l) $T(n) = \sqrt{2}T(n/2) + \log n$