

COP 3502 Recitation Sheet: Recurrence Relations

Directions: Each of these questions is from either a past Foundation Exam or one of my past exams. After your TA goes over one example carefully, please work together in small groups on each of these questions. For the last ten minutes of recitation, two problems should be selected by students to be solved on the board for everyone to see. All solutions will be posted after the end of the week.

1) Use the iteration technique to solve the following recurrence relation in terms of n:

$$\begin{aligned} T(n) &= 2T(n/2) + 1, \text{ for all integers } n > 1 \\ T(1) &= 1 \end{aligned}$$

Find a tight Big-Oh answer.

2) What is the closed form solution to the following recurrence relation? Please use the iteration technique, show all of your work and provide your final answer in Big-Oh notation.

$$\begin{aligned} T(1) &= 1 \\ T(n) &= 2T(n/4) + 1 \end{aligned}$$

3) Use the iteration technique to determine a close form solution for the recurrence relation $T(n)$ defined below. Note: due to the nature of this recurrence, it's possible to get an exact solution for $T(n)$, so please try to do that instead of just getting a Big-Oh bound.

$$\begin{aligned} T(n) &= 2T(n - 1) + 2^n \\ T(1) &= 2 \end{aligned}$$

4) Using the iteration technique, find a Big-Oh bound for the following recurrence relation, in terms of n:

$$\begin{aligned} T(n) &= 2T\left(\frac{n}{2}\right) + n^2, \text{ for } n > 1 \\ T(1) &= 1 \end{aligned}$$

5) Use the iteration technique to determine a Big-Oh solution for the following recurrence relation:

$$T(n) = 4T\left(\frac{n}{2}\right) + n^2, T(1) = 1$$