CSC 6013 – Summer 2022

Worksheet for week 5 – Recurrence relations and asymptotic analysis

Submit your work as a docx or pdf file through Blackboard.

Show your work, not just your final answer!!!!

If the work performed by an algorithm in the worst case is given by the recurrence relation use the indicated technique(s) to determine the algorithm's asymptotic class Big-Oh.

Back Substitution

1) $T(n) = 2T(n-1) + 1 \ , \ T(0) = 1$

Use back-substitution. Give a tight upper bound.

2) $T(n) = T(n-2) + n^2 \ , \ T(0) = 1$

Use back-substitution. Give a loose upper bound.

3) $T(n) = T(n-1) + \frac{1}{n} \ , \ T(0) = 1$

Use back-substitution. Go online and find a formula for the sum of the "harmonic series". Using this online result, give a loose upper bound.

Master Method

4) $T(n) = 2T\left(\frac{n}{4}\right) + 1$, $T(0) = 1$

Use the master method

5) $T(n) = 2T\left(\frac{n}{4}\right) + \sqrt{n}$, $T(0) = 1$

Use the master method

6) $T(n) = 2T\left(\frac{n}{4}\right) + n^2$, $T(0) = 1$

Use the master method

7) $T(n) = 10T\left(\frac{n}{3}\right) + n^2$, $T(0) = 1$

Use the master method. In your answer, round the value of the logarithm to 2 decimal places.

8) $T(n) = 2T\left(\frac{2n}{3}\right) + 1$, $T(0) = 1$

Use the master method. Hint: rewrite $\frac{2n}{3}$ as $\frac{n}{3/2}$