

# Problem Set 1

CS 331

Due Thursday, September 14

General rules:

- For full credit, you must give proofs of every step.
- Either typeset your solutions or write in clearly legible handwriting. The TA *will* dock points for bad handwriting.
- Collaboration is encouraged, but you must write up the solutions on your own and acknowledge your collaborators at the top of your solutions.
- Upload PDFs of your solutions to Canvas.

1. Recursive time bounds: give a big-O bound for  $T(n)$  given each of the following recursive formulas:

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

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

(c)  $T(n) = 5T(n/4) + n$

(d)  $T(n) = 9T(n/3) + n^2$

with the base case  $T(n) = O(1)$  for any constant  $n$ .

2. There's a Jupyter Notebook linked from the class webpage. Run through it, then answer the questions at the end. Don't wait till the last day to do this: setting up the required libraries may take some time.