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.