

- See Practice Problems Sets 1 and 2 for instructions.
- Explicitly state all the assumptions that you use in your analysis.

1. Unroll each of the following recurrences to come up with an estimate $f(n)$ that satisfies $T(n) = \Theta(f(n))$.

In each case, verify your estimate by induction. Note that this involves verifying *two* asymptotic bounds for each part, for the *same* function f .

In each case, you may assume bounds of the form $T(n') \leq c'$ and $T(n'') \geq c''$ where n', n'', c', c'' are all fixed constants of your choice. That is, you may assume constant upper and lower bounds for inputs of up to some constant size.

(a) $T(n) = 4T(n/2) + 5n$

(b) $T(n) = 3T(n/2) + 5n$

(c) $T(n) = 2T(n/2) + 5n\sqrt{n}$

(d) $T(n) = 2T(n/2) + \frac{2n}{\log_2 n}$

(e) $T(n) = T(n/2) + 3 \log_2 n$

(f) $T(n) = 2T(n/3) + 4\sqrt{n}$