1 Recursion trees

Consider the recurrence relation $T(n) = 5T\left(\frac{n}{4}\right) + 2n$
What is the number of problems in level 4? (We use the convention that the root problem of size $n$ is on level 0.)
- 1024
- 125
- 625
- 4096
Correct

What is the size of each problem in level 5?
- $n^{5}$
- $n^{3125}$
- $n^{1024}$
- $n^{625}$
Correct

What is the total contribution in level $i$?
- $(\frac{5}{4^i}) \times 2n$
- $(\frac{5}{4^i}) \times 2n$
- $(\frac{5}{4^i}) \times 2n$
- $(\frac{5}{4^i}) \times 2n$
Correct

Which one is true for $T(n)$?
- $T(n) = \Theta(n \log(\frac{n}{4}))$
- $T(n) = O(n^2)$
- $T(n) = \Omega(n)$
- All of the above!
Correct

2 The master theorem

Remember that the master theorem applies to recurrences of the form
$T(n) = aT\left(\frac{n}{b}\right) + O(n^d)$.
Consider the recurrence relation $T(n) = 3T\left(\frac{n}{81}\right) + 10\sqrt[4]{n}$. What are the values of the parameters $a, b, d$? Write fractional values in the form of $0.x$ or $0.xx$.

$a = \boxed{3}$
Correct

$b = \boxed{81}$
Correct

$d = \boxed{0.25}$
Correct

Which one is true for $T(n)$?
- $T(n) = \Theta(n)$
- $T(n) = \Theta(n^2)$
- $T(n) = \Omega(\log(n)\sqrt[n]{n})$
Correct

3 The substitution method

Consider the recurrence relation $T(n) = 2T(\frac{n}{2}) + T(\frac{n}{3}) + n^2$. Which one is the smallest valid bound for $T(n)$?
- $T(n) = O(n)$
- $T(n) = \Omega(n^2)$
- $T(n) = O(n^2)$
Correct

Which one would be the best guess to substitute $T(n)$ with if we wanted to prove the above bound? (Which bound would be provable by induction as in the substitution method and is the tightest such bound.)
- $T(n) \leq 12n$
- $T(n) \leq n^2$
- $T(n) \leq 6n^2$
- $T(n) \leq 2n^2$
Correct