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1 The Recursion Tree Method

- expand for k iterations to get a tree
- set k to reach base case
- sum everything

Example: $T(n) = 5T(n/4) = \sqrt{n}$
By tree, we get:
$n/4^k = 1$
$T(n) = (\sum_{i=0}^{k-1} (5/2)^i \sqrt{n}) + 5^k = \Theta(n^{\log_4 5})$

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2 The Master Method

- look up answer!
- doesn't work for everything: if $f(n) = n/\log n$, it does not work

Let $T(n) = aT(n/b) + n^d$
Let $x = \log_b a$. if:

- $d > x : T(n) = \Theta(n^d)$
- $d = x : T(n) = \Theta(n^x \log n)$
- $d < x : T(n) = \Theta(n^x)$

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3 The Guess-and-Check Method

- guess
- verify by induction proof (often the proof inducts on $n/2$, then prove for n)
- fill in constants
- **Remember to solve for c afterwards** - to satisfy inductive step
- this only gets you either O or Ω with every "run" of the induction

Sometimes, we'll need to add a $-c$ constant at the end of the guess for induction to work