



# A tighter upper bound!

**IDEA:** Strengthen the inductive hypothesis.

- *Subtract* a low-order term.

*Inductive hypothesis:*  $T(k) \leq c_1 k^2 - c_2 k$  for  $k < n$ .

$$\begin{aligned} T(n) &= 4T(n/2) + n \\ &= 4(c_1(n/2)^2 - c_2(n/2)) + n \\ &= c_1 n^2 - 2c_2 n + n \\ &= c_1 n^2 - c_2 n - (c_2 n - n) \\ &\leq c_1 n^2 - c_2 n \quad \text{if } c_2 \geq 1. \end{aligned}$$

Pick  $c_1$  big enough to handle the initial conditions.