

**Some recurrences we should know.**

1) The recurrence

$$T(N) = \begin{cases} a, & \text{if } N \text{ is small} \\ T(N-1) + bN, & \text{otherwise} \end{cases}$$

has solution  $T(N) = \Theta(N^2)$ . Examples: insertion sort, quick-sort

2) The recurrence

$$T(N) = \begin{cases} a, & \text{if } N \text{ is small} \\ T(N/2) + b, & \text{otherwise} \end{cases}$$

has solution  $T(N) = \Theta(\log N)$ . Example: binary search

3) The recurrence

$$T(N) = \begin{cases} a, & \text{if } N \text{ is small} \\ 2T(N/2) + bN, & \text{otherwise} \end{cases}$$

has solution  $T(N) = \Theta(N \log N)$ . Example: merge sort

4) The recurrence

$$T(N) = \begin{cases} a, & \text{if } N \text{ is small} \\ 2T(N/2) + b, & \text{otherwise} \end{cases}$$

has solution  $T(N) = \Theta(N)$ . Example: a (rather silly) recursive implementation of finding the minimum