

Common Recurrences

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In each recurrence below, k with any subscript indicates an arbitrary positive constant.

1 Linear

$$T(n) = \begin{cases} k_0 & \text{if } n = 0 \\ k_1 + T(n - k_2) & \text{if } n > 0 \end{cases} \quad O(n)$$

$$T(n) = \begin{cases} k_0 & \text{if } n = 0 \\ kn + T(n/2) & \text{if } n > 0 \end{cases} \quad O(n)$$

$$T(n) = \begin{cases} k_0 & \text{if } n = 0 \\ k + 2T(n/2) & \text{if } n > 0 \end{cases} \quad O(n)$$

$$T(n) = \begin{cases} k_0 & \text{if } n = 0 \\ k \log n + 2T(n/2) & \text{if } n > 0 \end{cases} \quad O(n)$$

2 Sub-linear

$$T(n) = \begin{cases} k_0 & \text{if } n = 0 \\ k + T(n/2) & \text{if } n > 0 \end{cases} \quad O(\log n)$$

$$T(n) = \begin{cases} k_0 & \text{if } n = 0 \\ k \log n + T(n/2) & \text{if } n > 0 \end{cases} \quad O(\log^2 n)$$

$$T(n) = \begin{cases} k_0 & \text{if } n = 0 \\ k \log^2 n + T(n/2) & \text{if } n > 0 \end{cases} \quad O(\log^3 n)$$

3 Other

$$T(n) = \begin{cases} k_0 & \text{if } n = 0 \\ k_1 + 2T(n-1) & \text{if } n > 0 \end{cases} \quad O(2^n)$$

$$T(n) = \begin{cases} k_0 & \text{if } n = 0 \\ kn + 2T(n/2) & \text{if } n > 0 \end{cases} \quad O(n \log n)$$