

Worksheet — Landau, Recurrence Relations

Asymptotic Behavior

Compare the following pairs of functions:

- (1) $3n^2 + 5n + 1$ with $2n^3 - 3n + 5$
- (2) $\log(\log(n))$ with $\log(n)$
- (3) 3^n with 4^n

Recurrence with substitution method

- (1) $T(n) = 2^n T(n/2) + n$ for n a binary power.

Recurrence with Master Theorem

Solve the following recurrences — if possible — with the Master's Theorem

- (1) $T(n) = 3T(n/4) + O(n)$
- (2) $T(n) = 8T(n/4) + O(n^{1.5})$
- (3) $T(n) = 2^n T(n/2) + O(n)$

Bogosort

Bogosort works by:

- (1) If the first and the last element of the array are not in order, swap them.
- (2) Sort the first 2/3 of the array.
- (3) Sort the last 2/3 of the array.
- (4) Sort the first 2/3 of the array.

Assuming that Bogosort recursively call itself, determines its complexity

Buzzsort works by:

- (1) Use Bubblesort to sort if the array has five or less members.
- (2) Using recursion, sort the first 3/5 of the list
- (3) Using recursion, sort the last 3/5 of the list
- (4) Using recursion, sort the first 3/5 of the list.

Determine its runtime.

Give an example with 5 elements showing that Buzzsort does not work properly.