

Algorithm Analysis Homework 1

Due by 3/21(Thu.) in class

1. Consider linear search (sequential search).
 - (a) How many elements of the input sequence need to be checked on the average, assuming that the element being searched for is likely to be any element in the array?
 - (b) How many elements to be checked in worst case?
 - (c) Express the time complexity ($T(n)$) of linear search algorithm in terms of data size n .
 - (d) Solve above recurrence equation. You may use any method covered in class.
2. Indicate, for each pair of expression (A, B) in the table below, whether A is O , o , Ω , ω , or Θ of B. Assume that $k \geq 1$ and $c > 1$ are constants. Your answer should be in the form of 'yes' or 'no'. Do just part (b) and (d) only.

	A	B	O	o	Ω	ω	Θ
a.	$\lg^k n$	n^\square					
b.	n^k	c^n					
c.	\sqrt{n}	$n^{\sin n}$					
d.	2^n	$2^{n/2}$					
e.	$n^{\lg c}$	$c^{\lg n}$					
f.	$\lg(n!)$	$\lg(n^n)$					

3. Use a recursion tree to determine a good asymptotic upper bound on the recurrence $T(n) = 2T(n-1) + 1$, where $T(1) = 1$.
4. Use the master method to give tight asymptotic bounds for the following recurrences.

- (a) $T(n) = 6T\left(\frac{n}{3}\right) + n^3$
- (b) $T(n) = 3T\left(\frac{n}{3}\right) + n^2$