Practice Problems Set 2

Fall 25

1. Relative Asymptotic Growths (attributed to CLRS Problem 3-2)

   Indicate, for each pair of expressions (A, B) in the table below whether A is O, o, Ω, ω, or Θ of B. Assume that $k \geq 1, \epsilon > 0$, and $c > 1$ are constants. Write your answer in the form of "yes" or "no" in each box.

A	B	O	o	Ω	ω	Θ
$\lg^k n$	n^ϵ					
n^k	c^n					
$\sqrt{n}$	$n^{\sin n}$					
2^n	$2^{n/2}$					
$n^{\lg c}$	$c^{\lg n}$					

Solution:

A	B	O	o	Ω	ω	Θ
$\lg^k n$	n^ϵ	yes	yes	no	no	no
n^k	c^n	yes	yes	no	no	no
$\sqrt{n}$	$n^{\sin n}$	no	no	no	no	no
2^n	$2^{n/2}$	no	no	yes	yes	no
$n^{\lg c}$	$c^{\lg n}$	yes	no	yes	no	yes

2. Asymptotic Notations (Attributed to CLRS Exercise 3.2-2)

   Explain why the statement, "The running time of Algorithm A is at least $O(n^2)$," is meaningless.

Solution:

Since O-notation provides only an upper bound, and not a tight bound, the statement is saying that the running of time of algorithm A is at least a function whose rate of growth is at most n^2.