Review 3

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1. Write O if an entry is true or X otherwise.

	$O(n\lg n)$	$\Omega(n\lg n)$	$\Theta(n\lg n)$
$\lg n$	O	X	X
n	O	X	X
$n\lg n$	O	O	O
$n\lg^2 n$	X	O	X
n^2	X	O	X

2. Show $3n + 1 = O(n^2)$ by the definition of O.

$3n+1 \le cn^2$

WHEN $c=4$, $n_0=1$

$\rightarrow 3n+1 \le cn^2 \quad (n \ge 1)$

$\therefore 3n+1 = O(n^2)$

3. Write asymptotic notations that satisfy each relation and explain why.

(1) Transitivity

ex> O is transitive because $f(n) = O(g(n))$ and $g(n) = O(h(n))$ implies $f(n) = O(h(n))$.

Ω is transitive because $f(n) = \Omega(g(n))$ and $g(n) = \Omega(h(n))$ implies $f(n) = \Omega(h(n))$

Θ is transitive because $f(n) = \Theta(g(n))$ and $g(n) = \Theta(h(n))$ implies $f(n) = \Theta(h(n))$

o is transitive because $f(n) = o(g(n))$ and $g(n) = o(h(n))$ implies $f(n) = o(h(n))$

ω is transitive because $f(n) = \omega(g(n))$ and $g(n) = \omega(h(n))$ implies $f(n) = \omega(h(n))$

(2) Reflexivity

Θ is reflexive because $f(n) = \Theta(f(n))$

O is reflexive because $f(n) = O(f(n))$

Ω is reflexive because $f(n) = \Omega(f(n))$

(3) Symmetry

Θ is symmetric because $f(n) = \Theta(g(n))$ if and only if $g(n) = \Theta(f(n))$

(4) Transpose symmetry

O and Ω is transpose symmetric because $f(n) = O(g(n))$ if and only if $g(n) = \Omega(f(n))$

o and ω is transpose symmetric because $f(n) = o(g(n))$ if and only if $g(n) = \omega(f(n))$