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Algorithms 2545

AsymptoticsDrill-2

determine whether f = O(g) (write “1”), or f = Ω(g) (write “2”), or f = Θ(g) (write “3”).

ROW	F(n)	G(n)	Your Answer (1/2/3)
1	log n^2	log n + 5	3
2	Sqrt(n)	log n^2	2
3	log^2 n	log n	2
4	n	log^2 n	2
5	n log n + n	log n	2
6	10^10	log 42	3
7	2^n	10 n^2	2
8	2^n	1.5^n	2
9	2(log n)^2	Log n + 1	2?
10	2^n	2^2n	1

1. No, The bound can be tighter, O(n^2) simply states that worst case the algorithm performs n^2, this leaves O(n) performance a possibility for some inputs and can not be ruled out.
2. No, the upper bound can be looser, namely up to n^2 behavior; Therefore some inputs may have n^2 performance.
3. Yes, Theta means its bounded above and below by a function/behavior, in this case n^2. That means worst case is n^2 and best case is n^2, therefore it is impossible for any inputs to be bounded from above(worst case) by n because that would be a contradiction to the assertion that the functions best case is n^2. Therefore it is impossible for the algorithm to be O(n) on any inputs .
4. Yes, one thing Theta tells us is that its bounded from below(best possible performance for this algorithm) by (in this case) n^2 performance. Therefore it must be impossible for any input to achieve an O(n) performance.
5. Yes, because in both instances the highest order term is n^2 which characterizes the behavior for both upper and lower bound.