

CS3230: Assignment for Week 2

Due: Sunday, 30th Jan 2022, 11:59 pm SGT.

Please upload PDFs containing your solutions (hand-written & scanned, or typed) by 30th Jan, 11:59 pm to **Assignments/Assignment2/Submissions**. Name the file **Assignment2_SID.pdf**, where SID should be replaced by your student ID.

You may discuss the problems with your classmates or read material online, but you should write up your solutions on your own. Please note the names of your collaborators or online sources in your submission; failure to do so would be considered plagiarism.

1. (1 point) Indicate, for each pair of expressions (A, B) in the table below, whether A is O , o , Ω , ω , or Θ of B . Your answer should be in the form of the table with “yes” or “no” written in each box. No proof is required.

	A	B	O	o	Ω	ω	Θ
(a)	$n^3 + 4n$	$(\lg n)^{2022}$					
(b)	n^9	1.01^n					
(c)	$n^{1.5}$	$n \lg n$					
(d)	2^n	3^n					
(e)	$\lg(n^4)$	$\lg(n^8)$					
(f)	n^{10}	$n^{\lg n}$					

2. (1 point) Suppose you have functions $f(n)$ and $g(n)$ such that $f(n) = O(g(n))$. Is it always true that $2^{f(n)} = O(2^{g(n)})$? Justify your answer.
3. (1 point) Suppose the function f is defined recursively as follows: $f(2) = 2$ and $f(n) = 2f(n/2) + n$ for n that is a power of 2. Prove by induction that $f(n) = n \lg n$. (Recall that \lg denotes the logarithm with base 2.)