

AMERICAN UNIVERSITY OF BEIRUT
Mathematics Department
MATH 211 - Worksheet
Fall 2010-2011

- 1) Show that $(n + a)^b = O(n^b)$ for any real number a and positive whole number b .
- 2) Is $5^{n+1} = O(5^n)$? Is $5^{n+n} = O(5^n)$?
- 3) Are there any functions that are not comparable using growth of functions notation?
- 4) page 192 exercise 36
- 5) page 192 exercise 39
- 6) Show that $n \log n$ is $O(\log n!)$.
- 7) Show that $\log n!$ is $\Theta(n \log n)$.
- 8) Show that $\lceil \ln n \rceil$ is $\Theta(\ln n)$.
- 9) Complete the following with the appropriate notation.
 f is bounded above by g (up to constant factor) asymptotically means
 f is bounded below by g (up to constant factor) asymptotically means
 f is bounded both above and below by g (up to a constant factor) asymptotically means
.....

10) Homework due Wed., Dec.15, 2010 (beginning of class)

Answer by yes or no. Justify. ($k \geq 1, c > 1, k' > 0$)

A	B	Is $A=O(B)$?	Is $A=\Omega(B)$?	Is $A=\Theta(B)$?
$\log(n!)$	$\log(n^n)$			
$n^{\log c}$	$c^{\log n}$			
2^n	$2^{n/2}$			
n^k	c^k			
$\log^k n$	$n^{k'}$			
e^n	2^n			