

Practice these problems before class on October 15. The answers to these problems will be covered in this class. Understanding the answers to these questions is the best preparation for the midterm.

1. For each of the following, indicate whether  $f = O(g)$ ,  $f = \Omega(g)$  or  $f = \Theta(g)$ . If  $f = \Theta(g)$ , saying  $f = O(g)$  will not earn full marks.

	$f(n)$	$g(n)$	answer
(a)	$3n + 6$	$10000n - 500$	
(b)	$n^{7/8}$	$n^{1/2}$	
(c)	$\log_4(7n)$	$\log_{10}(n)$	
(d)	$n^{1.00001}$	$n \log n$	
(e)	$\sqrt{n}$	$(\log n)^4$	
(f)	$n2^n$	$3^n$	

2. Order the following functions from *slowest growing* to *fastest growing*. In particular, if you order  $f(n)$  before  $g(n)$ , then  $f(n) = O(g(n))$ . Break ties arbitrarily.

$$2^{\log n} \quad (3/2)^n \quad n^3 \quad \log n \quad n2^n \quad \ln n \quad 1 \quad n \quad 2^n \quad n \log n$$

(In the above,  $\log$  denotes the base-2 logarithm and  $\ln$  denotes the base- $e$  or natural logarithm.)

3. Question 1.4 from DPV: Show  $\log(n!) = \Theta(n \log n)$