Practice Assignment 1

Due: Tuesday, Jan 12th at 2pm to Canvas

To get credit, each student must submit their own solutions (no need to be typeset, but must be submitted as a pdf) to CANVAS by the due date above – no late submissions are allowed. Note that while you must each submit solutions individually, you are free to work through the problem sets in groups. Solutions will be posted shortly after class and may be discussed in class. These will be graded on the basis of *completion* alone, not *correctness*.

1. Sort the following terms from *slowest* growing to *fastest* growing. If two terms are equivalent asymptotically, draw a circle around them in your ordering.

$$(\log n + 1)^3 \quad 7^{2n} \quad n^{1/2} \quad n^{\log_3 7} \quad 2^{7n} \quad 1000(\log n)^3 \quad 2^{\log_2 n} \quad n \log n \quad 5^{\log_3 n}$$

2. For each of the following, indicate whether $f = O(g)$, $f = \Omega(g)$ or $f = \Theta(g)$.

	$f(n)$	$g(n)$
(a)	$3n + 6$	$10000n - 500$
(b)	$n^{1/2}$	$n^{2/3}$
(c)	$\log(7n)$	$\log(n)$
(d)	$n^{1.5}$	$n \log n$
(e)	$\sqrt{n}$	$(\log n)^3$
(f)	$n2^n$	3^n

3. Show that, if c is a positive real number, then $g(n) = 1 + c + c^2 + \cdots + c^n$ is

   (a) $\Theta(1)$ if $c < 1$

   (b) $\Theta(n)$ if $c = 1$

   (c) $\Theta(c^n)$ if $c > 1$

   The moral: in big-Θ terms, the sum of a geometric series is simply the first term if the series is strictly decreasing, the last term if the series is strictly increasing, of the number of terms if the series is unchanging.

4. Show that $\log(n!) = \Theta(n \log n)$.