Practice Assignment 1

Due: Tuesday, September 13 at 2PM to TEACH

Solutions to these need not be typeset, but must be submitted as a pdf, *individually*, to TEACH by the due date – no late submissions are allowed. Solutions will be posted shortly after class and may be discussed in class. These will be not 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 $\log(n!) = \Theta(n \log n)$.