1. Fill in the following table:

Symbol	$\lim_{n\to\infty} \frac{f(n)}{g(n)}$	informal meaning	formal definition
$f(n) = \mathrm{O}(g(n))$		less than or equal to	
$f(n) = \mathrm{o}(g(n))$	$= 0$		
$f(n) = \Omega(g(n))$			
$f(n) = \Theta(g(n))$			$f(n) = \mathrm{O}(g(n)) \wedge f(n) = \Omega(g(n))$

2. [HARD] Sort the following functions from slowest growing to fastest: (a) $\log\log n$, (b) $n^{(1/(\log\log n))}$, (c) $n^{(1/(\log n))}$.

3. The point of this question is to get a Θ-estimate for $\log(n!)$.

(a) Show that $n! \leq n^n$.

(b) Show that $\log(n!) = \mathrm{O}(n \log n)$.

(c) Show that $n! \geq (n/2)^{\lceil n/2 \rceil}$. (Hint: $n! \geq n!/\lfloor n/2 \rfloor!$.)

(d) Show that $\log(n!) = \Omega(n \log n)$.

(e) Give a Θ-estimate for $\log(n!)$.

4. (a) If a $\Theta(n \log n)$-sorting algorithm takes 2 minutes to sort 10 000 student records, how long is it likely to take to sort 1 000 000 student records?

(b) If a $\Theta(n^2)$-sorting algorithm takes 15 seconds to sort 10 000 student records, how long is it likely to take to sort 1 000 000 student records?