Asymptotic notation cheat sheet

Rough Guide

class	in English	meaning (rog = rate of growth)	key phrases
$f(n) = O(g(n))$	big-oh	rog of $f(n) \leq$ rog of $g(n)$	$f(n)$ is asymptotically no worse than $g(n)$ $f(n)$ grows no faster than $g(n)$
$f(n) = \Theta(g(n))$	big-theta	rog of $f(n) \approx$ rog of $g(n)$	$f(n)$ is asymptotically equivalent to $g(n)$ $f(n)$ grows the same as $g(n)$
$f(n) = \Omega(g(n))$	big-omega	rog of $f(n) \geq$ rog of $g(n)$	$f(n)$ is asymptotically no better than $g(n)$ $f(n)$ grows at least as fast as $g(n)$

Formal Definitions (in the course we use the highlighted ones)

class	formally	working
$f(n) = O(g(n))$	$\exists c > 0,\ \exists n_0 > 0,\ \forall n > n_0, f(n) \leq c \cdot g(n)$	
$f(n) = \Theta(g(n))$	$\exists c_1, c_2 > 0,\ \exists n_0,\ \forall n > n_0,\ c_1 \cdot g(n) \leq f(n) \leq c_2 \cdot g(n)$	$f(n) = O(g(n))$ and $g(n) = O(f(n))$
$f(n) = \Omega(g(n))$	$\exists c > 0,\ \exists n_0,\ \forall n > n_0,\ c \cdot g(n) \leq f(n)$	$g(n) = O(f(n))$

Using Limits

$$\text{If } \lim_{n\to\infty} \frac{f(n)}{g(n)} = \begin{cases} 0 & then\ \ f(n) = O(g(n)) \\ some\ finite, non-zero, positive\ constant & then\ \ f(n) = \Theta(g(n)) \\ \infty & then\ \ f(n) = \Omega(g(n)) \end{cases}$$