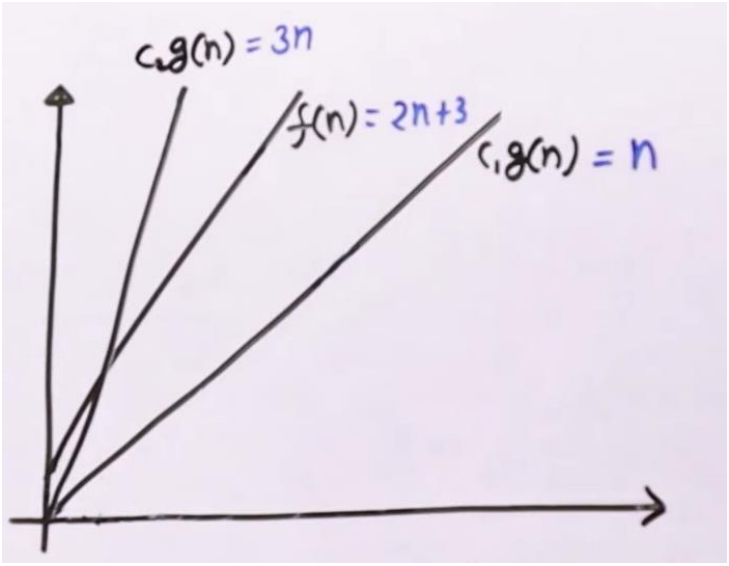
Theta Notation

$f(n) = \Theta(g(n))$ if there exist constants c_1 and c_2 (where $c_1 > 0$ and $c_2 > 0$) and n_0 (where $n_0 \geq 0$) such that $c_1 g(n) \leq f(n) \leq c_2 g(n)$ for all $n \geq n_0$



$1000n^2 + 100n \log n + 2n : \Theta(n^2)$

$200n^3 + 30n + 5 : \Theta(n^3)$

$2000n + 2 \log n : \Theta(n)$

$f(n) = 2n + 3 : \Theta(n)$

$c_1 = 1, c_2 = 3$

$1 \times n \leq 2n + 3 \leq 3n$

$n \geq 0$ $\quad$ $n \geq 3$ $\quad$ $n_0 = 3$

1. If $f(n) = \Theta(g(n))$
   then $f(n) = O(g(n))$ and $f(n) = \Omega(g(n))$
   and $g(n) = O(f(n))$ and $g(n) = \Omega(f(n))$
2. Represents exact bound
3. $\{100, 10^5, \log 2000, \ldots\} \in \Theta(1)$
   $\{100n, 2n + \log n, 5n + 3, \ldots\} \in \Theta(n)$
   $\{2n^2, n^2/4, 5n\log n, \ldots\} \in \Theta(n^2)$