Big O Notation.

$f(n) = O(g(n)) \Rightarrow f(x) \leq c \times g(x)$

Ex) Let $f(x) = 2x^2 + 3$, $g(x) = x^2$. Then, $f(x) = O(g(x))$?

Sol) Let $f(x) \leq c \times g(x)$, this inequality is as follows $2x^2 + 3 \leq cx^2$.

if c = 1 -> $2x^2 + 3 \leq x^2$ (x)

if c = 2 -> $2x^2 + 3 \leq 2x^2$ (x)

if c = 3 -> $2x^2 + 3 \leq 3x^2$ (o)

In this case, the following inequality forms: $3 \leq x^2$

if x = 1 -> $3 \leq 1$ (x)

if x = 2 -> $3 \leq 4$ (o)

Therefore, $f(x) = O(g(x))$ is true when c = 3 and $x \geq 2$.

Big Ω Notation.

$f(n) = \Omega(g(n)) \Rightarrow f(n) > c \times g(n)$ for all $n > n_0$

Ex) Let $f(x) = 2x^2 + 3$, $g(x) = x^2$. Then, $f(x) = \Omega(g(x))$?

Sol) Let $f(x) \leq c \times g(x)$.

if c = 1 -> $2x^2 + 3 > x^2$ (o)

Therefore, $f(x) = \Omega(g(x))$ is true.

Big Θ Notation.

$f(n) = \Theta(g(n))$ when, $f(x) = O(g(x))$ and $f(x) = \Omega(g(x))$.

Ex) Let $f(x) = 2x^2 + 3$, $g(x) = x^2$. Then, $f(x) = \Theta(g(x))$?

Sol) There are $f(x) = O(g(x))$ and $f(x) = \Omega(g(x))$.

Therefore, $f(n) = \Theta(g(n))$ is true.