Big O Notation

it is for worst case upper bound.

$f(n) \leq c\,g(n)$

for every

$c \geq 1$ & $n_0 \geq 1$

constant $n \geq n_0$

input threshold

$f(n) = 3n + 8$

$O(n)$ $\quad 3n + 8 \leq C\,g(n)$

$3n + 8 \leq 4n$

$C = 4$

$n_0 = 8$

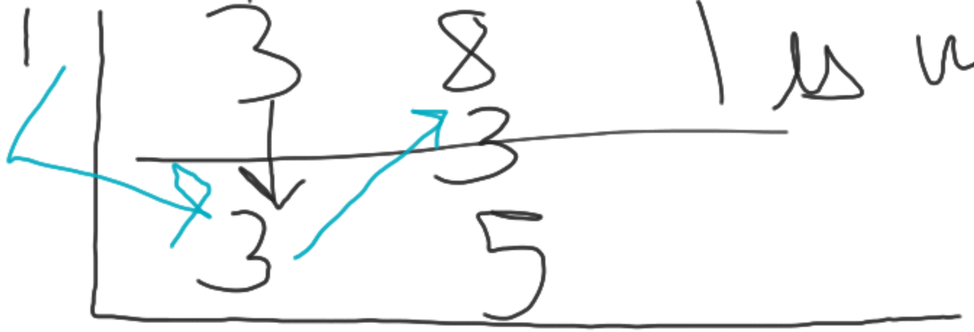
for n_0

$3n + 8 = 4n$

$8 = 4n - 3n$

$8 = n_0$

Upper bound



1 is upper bound

$f(n) = n^2 + 1$

$O(n^2)$ $\quad n^2 + 1 \leq C(n)$

$n^2 + 1 \leq 2n^2$

$C = 2$

$n_0 = 1$

for n_0

$n^2 + 1 = 2n^2$

$1 = 2n^2 - n^2$

$\sqrt{1} = n$

$1 = n$

$f(n) = n^4 + 100n^2 + 5$

$O(n^4)$

$n^4 + 100n^2 + 5 \leq c\varphi(n)$

$n^4 + 100n^2 + 5 \leq 2n^4$

$c = 2$

$n^4 + 100n^2 + 5 = 2n^4$

$100n^2 + 5 = n^4$

$f(n) = 2n^3 - 2n^2$

$O(n^3)$

$2n^3 - 2n^2 \leq 2n^3$

$c = 1$

$2n^3 - 2n^2 = 2n^3$

Example-5 Find upper bound for $f(n) = n$

Solution: $n \leq n$, for all $n \geq 1$

$\therefore n = O(n)$ with $c = 1$ and $n_0 = 1$

Example-6 Find upper bound for $f(n) = 410$

Solution: $410 \leq 410$, for all $n \geq 1$

$\therefore 410 = O(1)$ with $c = 1$ and $n_0 = 1$