CSE 101-01 4-27-23

Defn

Let $f(n)$, $g(n)$ are positive functions.

We write

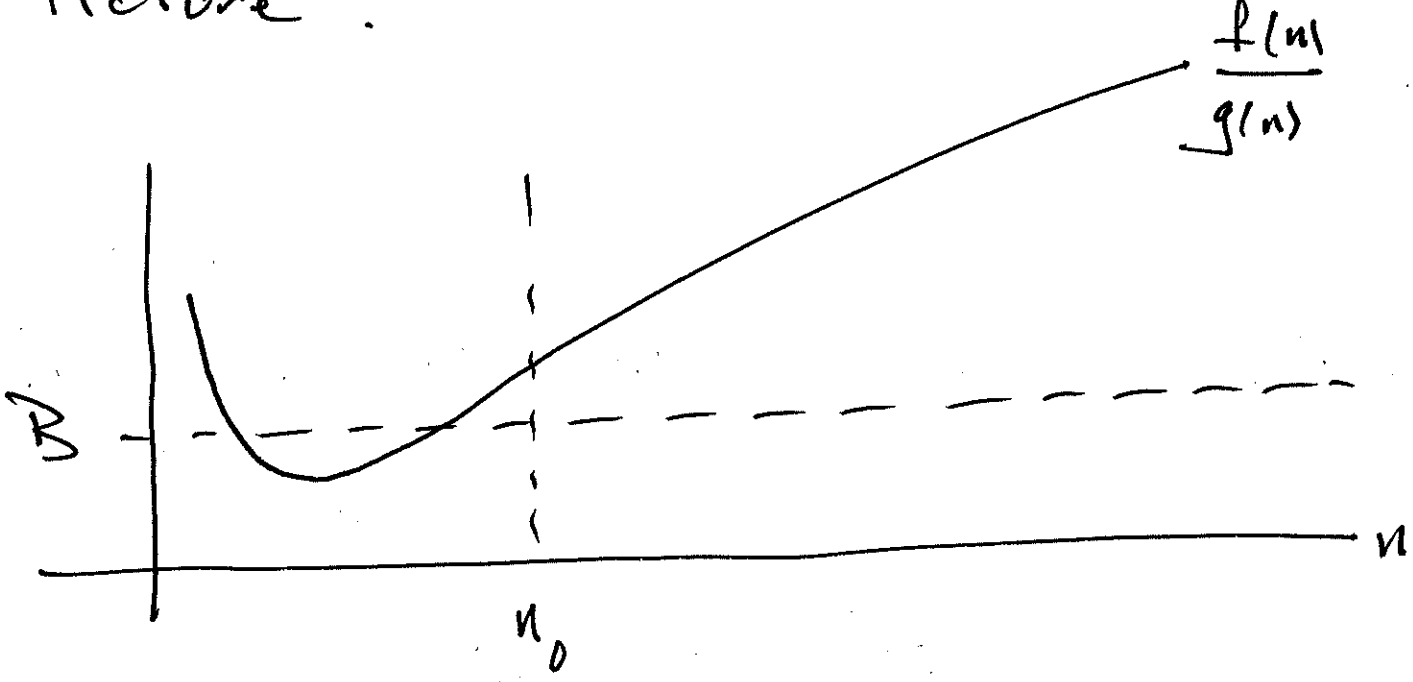
$$f(n) = \Omega(g(n))$$

iff there exist $B > 0$, $n_0 > 0$ s.t.

$$\frac{f(n)}{g(n)} \geq B \quad \text{(for all } n \geq n_0\text{)}$$

We say $g(n)$ is an asymptotic lower bound for $f(n)$.

Picture:



Ex. Let $f(n) = 6n^3 + 4$, $g(n) = 2n^2$. Let $B = 6$, $n_0 = 2$.

check! $\frac{6n^3+4}{2n^2} \geq 6$ for all $n \geq 2$

i.e. $3n + \frac{2}{n^2} \geq 6$ for all $n \geq 2$

Note: if $p(n)$, $q(n)$ are polynomials, then

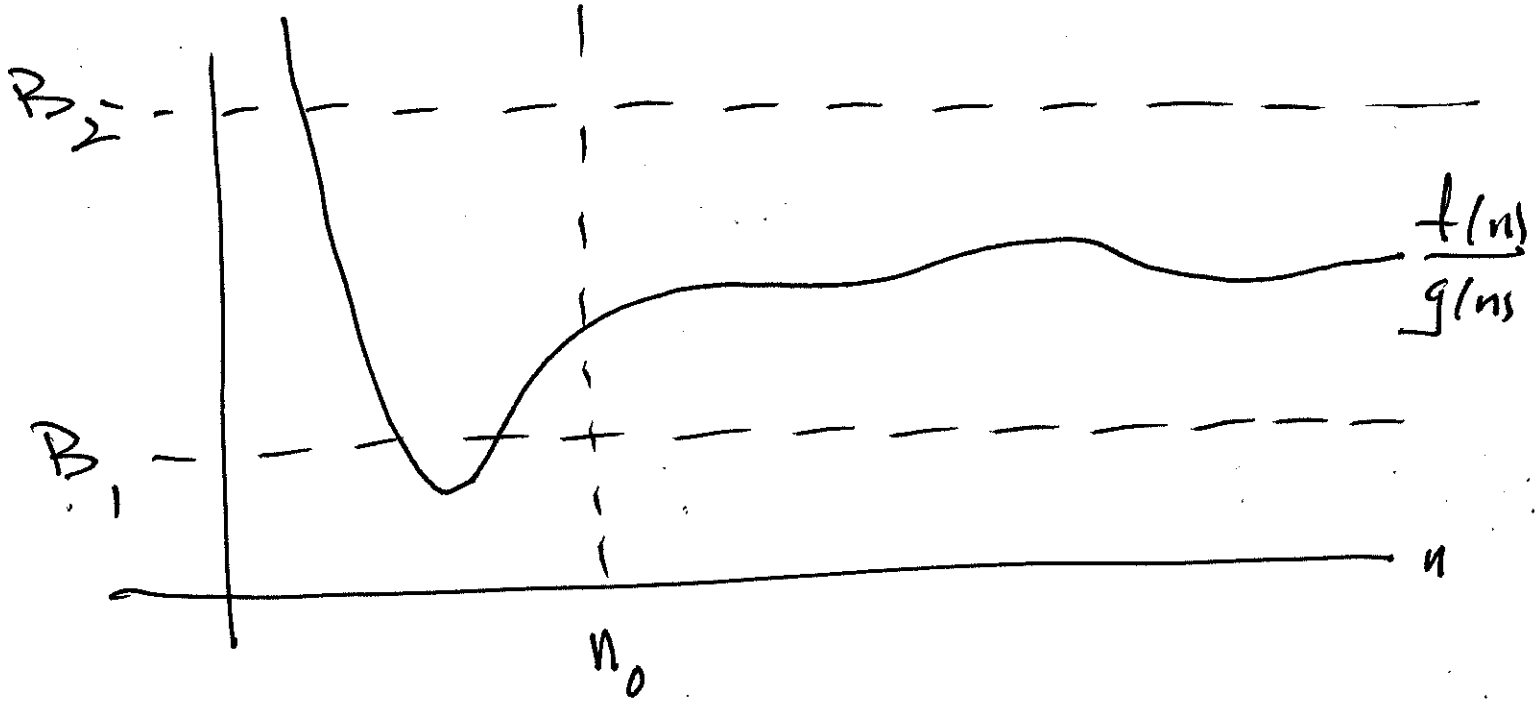
- $p(n) = O(q(n))$ iff $\deg(p(n)) \leq \deg(q(n))$
- $p(n) = \Omega(q(n))$ iff $\deg(p(n)) \geq \deg(q(n))$

Defn

We write $f(n) = \Theta(g(n))$ iff there exist pos. $B_1 > 0$, $B_2 > 0$, n_0 s.t.

$$B_1 \leq \frac{f(n)}{g(n)} \leq B_2$$

for all $n \geq n_0$



Ex. $f(n) = 5n^2 + 11n - 24$, $g(n) = n^2$

let $B_1 = 4$, $B_2 = 6$, $n_0 = 8$.

Check

$$4 \leq \frac{5n^2 + 11n - 24}{n^2} \leq 6$$

for all $n \geq 8$.

note :- if $P(n), q(n)$ are Polynomials, then

$$P(n) = \Theta(q(n)) \text{ iff } \deg(P(n)) = \deg(q(n))$$