Atividade 3

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f(n)	g(n)
n-100	n-200
log n	$(\log n)^2$
log n	$\log n^2$
2^n	2^{n+1}
n!	2^n
$2n^2 + 5n$	n^2
$2n^2+5n$	n^3

Atividade 03 - Lucas de Araújo

1) $f(n) = n-100$; $g(n) = n-200$

- $f(n) \leq 2 \cdot g(n), \forall n \geq 300 \therefore f(n) = O(g$

- $f(n) \geq 1 \cdot g(n), \forall n \geq 150 \therefore \Omega(g(n))$

- $f(n) = \Theta(g(n)) \rightarrow c_1 = 150, c_2 = 300$

- $\lim_{n \to \infty} \frac{n-100}{n-200} = \lim_{n \to \infty} \frac{1}{1} = 1 \therefore$

$f(n) \neq o(g(n))$
$f(n) \neq \omega(g(n)$

2) $f(n) = \log n$; $g(n) = (\log n)^2$

- $f(n) \leq 1 \cdot g(n), \forall n \geq 1 \therefore f(n) = O(g(n)$

- $\nexists c \mid f(n) >= c \cdot g(n) \therefore f(n) \neq \Omega(g(n))$

- $\lim_{n \to \infty} \frac{\log n}{(\log n)^2} = \lim_{n \to \infty} \frac{1}{\log n} = 0 \therefore f(n) = o$

$f(n) \neq \omega$

3) $f(n) = \log n$; $g(n) = \log n^2$

- $f(n) \leq 1 \cdot g(n), \forall n \geq 1 \therefore f = O(g(n)$

$\cdot f(n) \geq \frac{1}{2} \cdot g(n) \therefore f(n) = \Omega(g(n))$

$\cdot \lim_{n \to \infty} \frac{\log n}{\log n^2} = \frac{1}{2} \therefore f(n) \neq o(g(n))$
$f(n) \neq \omega(g(n))$

4) $f(n) = 2^n \; ; \; g(n) = 2^{n+1}$

$\cdot f(n) \leq 1 \cdot g(n) \; ; \; \forall n \geq 1 \therefore f(n) = O(g(n))$

$\cdot f(n) \geq \frac{1}{2} \cdot g(n) \therefore f(n) = \Omega(g(n))$

$\cdot f(n) = \Theta(g(n)) \to c_1 = \frac{1}{2}, \; c_2 = 1$

$\cdot \lim_{n \to \infty} \frac{2^n}{2^{n+1}} = \frac{1}{2} \therefore f(n) \neq o(g(n))$
$f(n) \neq \omega(g(n))$

5) $f(n) = n! \; ; \; g(n) = 2^n$

$\cdot f(n) \geq g(n) \; \forall n \geq 4$

$\cdot \nexists c \mid f(n) \leq c \cdot g(n) \therefore f(n) = \Omega(g(n)) \forall n \geq 4$

$\cdot \lim_{n \to \infty} \frac{n!}{2^n} = \infty \therefore f(n) \neq o(g(n)), f(n) = \omega(g(n))$

) $f(n) = 2n^2 + 5n \; ; \; g(n) = n^2$

- $f(n) \leq 7 \cdot g(n), \forall n \geq 1 \therefore f(n) = O(g(n))$
- $f(n) \geq 1 \cdot g(n) \therefore f(n) = \Omega(g(n))$
- $f(n) = \Theta(g(n)) \rightarrow c_1 = 1, c_2 = 7$
- $\lim_{n \to \infty} \frac{2n^2+5}{n^2} = 2 \therefore f(n) \neq o(g(n))$

$f(n) \neq \omega(g(n))$

7) $f(n) = 2n^2 + 5n;\ g(n) = n^3$

- $f(n) \leq 7 \cdot g(n), \forall n \geq 1 \therefore f(n) = O(g(n))$
- $\nexists c \mid f(n) \geq c \cdot g(n) \therefore f(n) \neq \Omega(g(n))$
- $\lim_{n \to \infty} \frac{2n^2+5n}{n^3} = 0 \therefore f(n) = o(g(n))$

$f(n) \neq \omega(g(n))$