

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

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

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

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

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

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

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

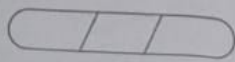
- $f(n) \leq 1 \cdot g(n), \forall n \geq 1 \therefore f(n) = O(g(n))$

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

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

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

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



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

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

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

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

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

$$\bullet f(n) = \Theta(g(n)) \rightarrow c_1 = \frac{1}{2}, c_2 = 1$$

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

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

$$\bullet f(n) \geq g(n) \forall n \geq 4$$

$$\bullet \nexists c < 1 f(n) \leq c \cdot g(n) \therefore f(n) = \omega(g(n)) \forall n \geq 4$$

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

$$6) f(n) = 2n^2 + 5n; g(n) = n^2$$

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$$\bullet f(n) \leq 7 \cdot g(n), \forall n \geq 1 \therefore f(n) = O(g(n))$$

$$\bullet f(n) \geq 1 \cdot g(n) \therefore f(n) = \Omega(g(n))$$

$$\bullet f(n) = \Theta(g(n)) \rightarrow c_1 = 1, c_2 = 7$$

$$\bullet \lim_{n \rightarrow \infty} \frac{2n^2 + 5}{n^2} = 2, \therefore f(n) \neq o(g(n))$$

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

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

$$\bullet f(n) \leq 7 \cdot g(n), \forall n \geq 1 \therefore f(n) = O(g(n))$$

$$\bullet \nexists c \mid f(n) \geq c \cdot g(n) \therefore f(n) \neq \Omega(g(n))$$

$$\bullet \lim_{n \rightarrow \infty} \frac{2n^2 + 5n}{n^3} = 0 \therefore f(n) = o(g(n))$$

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

