

Course Notes

21.1.9/11

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

$$f(n) \cdot n-100 > g(n) \cdot n-200$$

$$|c \cdot n-200| < |n-100| \quad p/n > 1$$

$$n+100 > c \cdot n+200$$

$$c = \frac{1}{101}$$

$$\frac{f(n)}{g(n)} \Rightarrow \frac{n-100}{n-200} = 1$$

2. $f(n) = \lg n$ $g(n) = (\lg n)^2$

$$\lg n < (\lg n)^2 \cdot c \quad p/n > 1 \quad f(n) = o(g(n))$$

$$c=1$$

3. $f(n) = \lg n$; $g(n) = \lg n^2$ $f(n) = O(g(n))$

$$\lg n \leq c \cdot \lg n^2 \quad p/n > 1 \quad c=1$$

$$\lg n \leq c \cdot 2 \cdot \lg n \quad p/n > 1$$

$$\lg n > c \cdot \lg n^2 \quad p/n > 1 \quad c = 1/4 \quad f(n) = \Omega g(n)$$

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

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

$$2^n \leq c \cdot 2^{n+1} \quad p/n > 0 \quad c=1 \quad f(n) = O(g(n))$$

$$2^n > c \cdot 2^{n+1} \quad p/n > 0 \quad c = \frac{1}{2} \quad f(n) = \Omega g(n)$$

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

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

$$n! \leq c \cdot 2^n \quad p/n > 0$$

$$\lim_{n \rightarrow \infty} \frac{n!}{2^n} \rightarrow \frac{n+1}{2^{n+1}} = \frac{n+1}{2^n \cdot 2} = \frac{n+1}{2} \cdot \frac{1}{2^n} = \infty$$

$$n! > c \cdot 2^n \quad p/n > 0 \quad c=1$$

$$f(n) = \omega g(n) \quad \text{cresce mais}$$

Teste de Razão

$$6. f(n) = 2n^2 + 5n \quad g(n) = n^2$$

$$2n^2 + 5n \leq C \cdot n^2$$

$$p/m=1$$

$$C=7$$

$$f(n) = O(g(n))$$

$$2n^2 + 5n \geq C \cdot n^2$$

$$p/m=1$$

$$C=1/7$$

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

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

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

$$2n^3 + 5n \leq C \cdot n^3$$

$$p/m=1$$

$$C=1$$

$$\lim_{n \rightarrow \infty} \frac{2n^3 + 5n}{n^3} = 2$$

} cross out

$$2n^3 + 5n < C \cdot n^3$$

$$f(n) = o(g(n))$$