PAA - Lucas Gomez dos Santos - 20.1.4108

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

$$f(n) \leq 2 \cdot g(n) \; \forall n \geq 300$$

$$f(n) \geq 1 \cdot g(n) \; \forall n \geq 150$$

$$f(n) = \Theta(g(n)) \; \forall n \geq 300$$

$$f(n) \neq 0(g(n)), \; f(n) \neq \omega(g(n))$$

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

31) $f(n) = \log n \quad g(n) = \log(n^2)$

$f(n) <= 1 \cdot g(n) \; \forall n >= 0$

$f(n) >= \frac{1}{2} \cdot g(n) \; \forall n >= 0$

$f(n) = \Theta(g(n)) \; \forall n >= 0$

$\lim\limits_{n \to \infty} \dfrac{\log n}{\log(n^2)} = \lim\limits_{n \to \infty} \dfrac{1}{2} = \dfrac{1}{2}$

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

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

$f(n) \leq 1 \cdot g(n) \quad \forall n \geq 0$

$f(n) \geq \frac{1}{2} \cdot g(n) \quad \forall n \geq 0$

$f(n) = \Theta(g(n)) \quad \forall n \geq 0$

$$\lim_{n \to \infty} \frac{2^n}{2^{n+1}} = \lim_{n \to \infty} \frac{1}{2} = \frac{1}{2}$$

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

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

$f(n) \leq 7 \cdot g(n) \quad \forall n \geq 0$

$f(n) \geq 1 \cdot g(n) \quad \forall n \geq 0$

$f(n) = \Theta(g(n)) \quad \forall n \geq 0$

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

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

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

$$f(n) <= 7 \cdot g(n) \; \forall n >= 0$$
$$f(n) >= 1 \cdot g(n) \; \forall n \geq 0$$
$$0 <= \omega \cdot \; f(n) = O(g(n)) \; \forall n >= 0$$

$$\lim_{n \to \infty} \frac{2n^2 + 5n}{n^3} = \lim_{n \to \infty} \frac{2 + \frac{5}{n}}{n} = 0$$

$$f(n) = O(g(n)) \qquad f(n) \neq \omega(g(n))$$