Laboratorio 8

Ejercicio 1

$f(n) = n^3 + 1 \quad g(n) = n^3$

$f(n) \leq c \cdot g(n)$

$n^3 + 1 \leq C \cdot n^3$

$n^3 + 1 \leq 4n^3$

$n^3 - 4n^3 \leq -1$

$n^3 \geq 1$

$; C = 4$

$n \geq -1$ ó $n \geq 1$

$f(n) \leq C \cdot g(n)$

$\forall \; n \geq n_0$

con $C = 2$ y $n_0 = \sqrt[3]{1}$

$f(n) = O(n^3)$

Ejercicio 2

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

$f(n) \leq C \cdot g(n)$

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

$n^2 + 2 \leq 4n^2$

$3n^2 \geq 2$

$n^2 \geq \frac{2}{3}$

$C = 4$

$n = -\frac{\sqrt{2}}{\sqrt{3}}$ ó $n = \sqrt{\frac{2}{3}}$

$f(n) \leq C \cdot g(n)$

$\forall \; n \geq n_0$

con $C = 4$ y $n_0 = \pm\sqrt{\frac{2}{3}}$

$f(n) = O(n^2)$

Ejercicio 3

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

$n^2+1 \leq C \cdot n^2$ $n = -\sqrt{\frac{1}{3}}$ ó $n = \sqrt{\frac{1}{3}}$

$n^2+1 \leq 4n^2$ $f(n) \leq g(n)$

$3n^2 \geq 1$ $\forall\ n \geq n_0$

$n^2 \geq \frac{1}{3}$ con $C=2$ y $n_0 = \sqrt{\frac{1}{3}}$

$f(n) = O(n^2)$

Ejercicio 4

```
int linear_search(int arr[], int n, int target){
    for (int i=0; i<n; i++){
        if (arr[i] == target){          n + 2
            return i;
        }
    }
    return -1;
```

Asignación

$t = C_1 \Rightarrow$ Arreglo

$t = C_1 \Rightarrow$ datos arreglo

$t = C_{31} \Rightarrow$ resultado

Ciclo $t = n$

Comparación

$t = C_2$

Asignación $t = C_1$

Operaciones del Algoritmo

$T = C_1 + C_1 + C_1 + n(C_2 + k(C_1))$

Peor Caso

$T = C_1 + C_1 + n(C_2 + n(C_1)) (C_1))$

$= 2C_1 + nC_2 + n^2(C_1))$

3

Mejor Caso

$T = C_1 + C_1 + n(C_2 + O(C_1))$

$= 2C_1 + nC_2$

Caso promedio

$T = \frac{1}{n+1} \left(\sum_{k=0}^{n} 2C_1 + \sum_{k=0}^{n} nC_2 + \sum_{k=0}^{n} k(C_1 + C_3) \right)$

$= 2C_1 + nC_2 + \frac{n^2}{2}$

Big-OH: $O(g(x))$

$f(x) = O(g(x))$, $x \to a$ si $\exists$ $C > 0$ t.q. $|f(x)| \leq C|g(x)| \; \forall \; |x-a| \leq \varepsilon$

$f(x) = O(g(x))$, $x \to a$ si $\exists$ $C > 0$ t.q. $\lim_{x \to a} \left| \frac{f(x)}{g(x)} \right| \leq C$