

Ejercicio 6

6. Sort the following functions in decreasing order of asymptotic complexity ($O(f(n))$):

$$f_1(n) = \sqrt{n} \\ = n^{1/2}$$

$$O(f_1(n)) = n$$

$$f_2(n) = n^3$$

$$O(f_2(n)) = n^3$$

$$f_3(n) = \binom{n}{4}$$

$$= \frac{n!}{4!(n-4)!}$$

$$= \frac{n(n-1)(n-2)(n-3)(\cancel{n-4})!}{4!(\cancel{n-4})!}$$

$$= \frac{(n^2-n)(n^2-3n-2n+6)}{24}$$

$$= \frac{n^4 - 6n^3 + 11n^2 - 6n}{24}$$

$$= \frac{1}{24} n^4 \left[1 - \frac{6}{n} + \frac{11}{n^2} - \frac{6}{n^3} \right]$$

$$O(f_3(n)) = n^4$$

$$f_4(n) = \sum_{i=2}^n (i-1)$$

$$= 1 + 2 + 3 + 4 + \dots + n-1$$

$$= \frac{n(n-1)}{2}$$

$$= \frac{n^2 - n}{2}$$

$$O(f_4(n)) = n^2$$

Entonces:

$$O(f_1(n)) = n$$

$$O(f_2(n)) = n^3$$

$$O(f_3(n)) = n^4$$

$$O(f_4(n)) = n^2$$

Ordenando en forma decreciente:

$$f_3 > f_2 > f_4 > f_1 //$$