

C Programming

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TP 03

Exercise 1:

Write the function `PolyLagrange`, which takes as arguments a list X that contains the points x_k , a point x and an index i .

The function should return the image of x by the i -th polynomial of Lagrange ($Li(x)$).

Exercise 2:

Using the `PolyLagrange` function previously implemented, write the `InterpLagrange` function which takes as arguments a list X that contains the points x_k , a function f and a point x .

The function should return the image of x by the Lagrange interpolating polynomial of f .

Exercise 3:

Consider the function $f : [a, b] \mapsto R$ and P_n its Lagrange interpolating polynomial in n points evenly distributed in $[a, b]$.

Draw in the same figure the curve of the function f , the curve of the polynomial function P_n as well as the interpolation points in the following cases:

- $f = \sin, a = 0, b = 2, n = 3, 10, 20$
- $f = \exp, a = 10, b = 10, n = 3, 10, 20$

Exercise 4:

Consider the function $f : [5, 5] \mapsto R$ such that $f(x) = \frac{1}{1+x^2}$

Draw in the same figure the curve of the function f , the curve of the polynomial function P_n as well as the interpolation points in the following two cases:

- evenly distributed points and $n = 3, 10, 20$.
 - Describe the results.
 - give an explanation.
- Tchebychev nodes $x_k = \frac{a+b}{2} + \frac{b-a}{2} \cos(\frac{2k+1}{n+1} \frac{\pi}{2}), k = 0, \dots, n, n = 3, 10, 20$
 - give and explanation.
 - conclude.