Series N°2: Polynomial Interpolation

Exercise 1

The following table represents the results due to physical measurement.

x_i	1	2	3	4
$f(x_i)$	1	3	2	5

Interpolate these results with Newton and Lagrange polynomials.

Exercise 2

1- Construct the Lagrange interpolation polynomial of the function $y = sin(\pi x)$ using the points

$$x_0 = 0, \; x_1 = \frac{1}{6}, \; x_2 = \frac{1}{2}.$$

2- Find the error made in calculation of $sin(\pi/8)$.

Exercise 3

Considering the function $f(x)$ determined by the following table.

x_i	2	2.5	4
$f(x_i)$	0.5	0.4	0.25

1- Construct the Lagrange polynomial to interpolate the function $y = f(x)$, and evaluate $f(3)$.
2- Knowing that $f(x) = 1/x$, find the maximum error by replacing $f(x)$ with the polynomial $P(x)$.

Exercise 4

Using Newton's interpolation polynomial, complete the following table:

x_i	0	1	2	3	4
$f(x_i)$	1	3	9		81

Exercise 5

Consider the following points.

x_i	0	1	2	3
$f(x_i)$	0	2	36	252

1- Find the Lagrange polynomial passing through the first 3 points.
2- Find the Lagrange polynomial passing through the first 4 points and evaluate $f(3.5)$. Is it possible to use the first polynomial to evaluate $f(3.5)$?
3- Find the approximations of $f(1.5)$ using the polynomials obtained in 1 and 2. Discuss the results.