

TD3 : Polynomial Interpolation

Exercise 1:

Construct the Lagrange interpolation polynomial for the data

x	-1	1	4	7
$f(x)$	-2	0	63	342

Hence, interpolate at $x = 5$.

Exercise 2:

The following table provides some application values of $y = x \sin x - 1$ to two decimal places.

x	1	1.1	1.2
y	-0.16	-0.02	0.12

1. Using inverse interpolation, calculate two decimal places of the smallest positive root for the equation

$$x \sin x = 1$$

2. estimate the error in the value of the inverse interpolation polynomial at the calculated root

Exercise 3:

1. Determine P_3 , the Newton interpolation polynomial passing through the points:

$(0, 1), (1, 2), (2, 9), (3, 28)$.

2. Deduce P_4 , the interpolation polynomial passing through the points $(0, 1), (1, 2), (2, 9), (3, 28)$, and

$(5, 54)$.

Exercise 4:

Consider the function $f(x) = \sin x$ known at the points $x = i \frac{\pi}{2}$ with $i = 0, 1, 2$

1. Determine the Lagrange interpolation polynomial of f at these points.
2. Determine the Newton interpolation polynomial of f at these points.
3. Deduce the approximate values of $f(\pi/4)$ Compare the results obtained.
4. Calculate the interpolation error and compare it with what you found in step 3