

Lab 3

Lagrange interpolation

Using *the barycentric form* of the Lagrange interpolation polynomial, solve the following problems:

Problems:

1. The table below contains the population of the USA from 1930 to 1980 (in thousands of inhabitants):

1930	1940	1950	1960	1970	1980
123203	131669	150697	179323	203212	226505.

Approximate the population in 1955 and 1995.

2. Approximate $\sqrt{115}$ with Lagrange interpolation, using the known values for three given nodes.

3. Plot the graphics of the function $f : [0, 10] \rightarrow \mathbb{R}$, $f(x) = \frac{1+\cos(\pi x)}{1+x}$ and of the Lagrange interpolation polynomial that interpolates the function f at 21 equally spaced points in the interval $[0, 10]$.

Facultative: 4. Plot the graphs of the function $f : [-5, 5] \rightarrow \mathbb{R}$, $f(x) = \frac{1}{1+x^2}$ and of the corresponding Lagrange interpolation polynomial obtained using 15 equally spaced points in the interval $[-5, 5]$. In the same window (use *subplot*), plot the same graphics but using 15 nodes obtained by lineary transformation $\frac{1}{2}((b-a)x_i + a + b)$ of Chebyshev zeros $x_i = \cos(\frac{(2j-1)\pi}{2n})$, $i = 1, \dots, n$ from the interval $[-1, 1]$ to the interval $[a, b]$.