

## 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  $x_i = \cos(\frac{(2i-1)\pi}{2n})$ ,  $i = 1, \dots, n$  from the interval  $[-1, 1]$  to the interval  $[a, b]$ .