Name: ______________________________

Date: _______________________________

Collaborators: ____

(If applicable, the collaborators submit their individually written assignments together)

Question:	1	2	3	4	Total
Points:	10	20	25	10	65
Score:					

Instructor/grader comments:

Lagrange interpolation

1. (10 points) (pen and paper problem) Let $\ell_k(x)$ be the Lagrange cardinal polynomial. Explain why for any distribution of n nodes and for any x

$$\sum_{k=0}^{n} \ell_k(x) = 1.$$

Barycentric formula

2. (pen and paper problem)

   (a) (10 points) Find the barycentric weights for the nodes: $t_0 = 0$, $t_1 = 1$, $t_2 = 3$.

   (b) (10 points) Find the interpolating polynomial, $p(x)$ for the data $y_0 = -1$, $y_1 = 1$, $y_2 = -1$ and compute $p(2)$.

Programming

3. (25 points) For the function

$$f(x) = \cosh(\sin(x))$$

compute the polynomial interpolant using n second kind Chebyshev nodes in $[-1, 1]$

$$x_k = -\cos\left(\frac{k\pi}{n}\right), \quad k = 0, 1, \ldots, n.$$

for $n = 4, 8, 12, \ldots, 60$. Use the barycentric-formula-based function `polyinterp` developed in class. For each value of n, compute the infinity-norm error (that is $\max|p(x) - f(x)|$ calculated for at least 4000 values of x). Plot the error as a function of n. Use a suitable coordinate axes.

Describe the behavior of the error vs n in the project's README file.

Provide axes labels, a grid, and a title for your graph.

Place the commands `clear`, `clf` at the top of your script.

Place the code for this problem into the script named **hw04p3.m**.

Gitlab

4. (10 points) Create a gitlab project called **hw04** (name it exactly as shown). Upload **all** Matlab files that are needed to run your code.

   Scan your answers/solutions of Problems 1 and 2, combine all scans into a single pdf file (call it **hw04.pdf**) and upload it to gitlab. **Do not** upload other types of files (e.g. no graphics files).

   Share the project with the instructor and the grader and grant them **Reporter** privileges.