

Project 1

Due: Tuesday April 3rd

Directions:

1. **Groups:** You can work together in a group of size at most 2. If you do choose to work together, both group members should write a brief summary of their contributions and submit this with the finished project. Make sure the final submission has the names of both group members.
2. **Objective:** To implement the natural cubic spline algorithm in Octave/MATLAB to generate a plot containing both a given function $f(x)$, and the natural cubic spline $S(x)$ that interpolates a given set of nodes.
3. **Specifications:** Create a script or function that allows you to easily specify:

- a list of x -values to use as the nodes
- a function and/or a list of y -values

and then to produce some representation of $S(x)$ such that you can generate a plot of

- $f(x)$
- $S(x)$
- $f(x) - S(x)$

4. **Testing:** For $f(x) = \sin(x)$ on the interval $[0, 10]$, experimentally determine how many equally spaced nodes, with $x_0 = 0$ and $x_n = 10$, are needed such that

$$|S(x) - f(x)| < 10^{-3}$$

everywhere on $[0, 10]$. Show this by plotting $S(x) - f(x)$ on $[0, 10]$ with appropriate y -limits for the graph and horizontal lines at $y = 10^{-3}$ and $y = -10^{-3}$.

5. **Submission:** Write a brief report that describes your experiment in the previous step and your conclusion (the number of nodes required) along with any supporting graphs, and attach a hardcopy of your code, and upload any M-files to Canvas under Project-1.