

COMPUTATIONAL PHYSICS LAB

(PH49012)

SPRING-2021, IIT KGP

Assignment 07

Q1. Consider a set of 10 equally spaced points on x axis, where $0 \leq x \leq \pi$. Let us consider a function $f(x) = \sin(x) + 2\cos(x)$. Take x_0 within the range as input. Compute $f(x_0)$ using Lagrange's interpolation. Round off your answer up to 3 decimal places, and put it as comment within your code. Now consider another array from 0 to π with 30 points. Make a graph of the interpolated values on top of the given data set. You should use proper legends in your plot. (20 points)

Q2. Consider a 10×10 domain (100 points) on xy plane, where $0 \leq x \leq \pi$ and $0 \leq y \leq \pi$. Now consider a function $f(x, y) = \sin(x + y) + \cos(x + y)$. Take (x_0, y_0) as input, and use Lagrange's interpolation to compute $f(x_0, y_0)$ rounded off up to 3 decimal places. Put your answer as comment within your code. (20 points)

Q3. A data set from 0 to π has been uploaded on MS Team's 'Files' section. Find the functional value at $x = \pi/2$ using interpolation theory. Plot the function in the given data range. Check the value again with half the number of the original data point. (20 points)

Q4. Given three data points $(1.0, 8.0)$, $(2.1, 20.6)$, and $(5.0, 13.7)$, write an interpolation program to find the y values in the range $[1.0, 5.0]$. Use both Lagrange and Cubic-spline methods to compare the values. (20 points)
