Department of Mathematics
Indian Institute of Technology Guwahati
MA311M: Lab Assignment 2

Date of Submission: 25/10/2020   **Weightage: 10 Marks**

1. Write a program to approximate the function

$$f(x) = \frac{1}{1+x^2}, \quad -5 \le x \le 5, \quad (\text{Runge's example}),$$

   using the points $x_i = -5 + 10\dfrac{i}{8}, \quad i = 1, 2, \ldots, 8$ by Lagrange's interpolating polynomial. Plot the polynomial against the exact function.   **[5 Marks]**

2. Write a program to approximate the graph of $f(x) = x + \frac{2}{x}$ using the natural cubic spline that passes through the points $\{(x_i, f(x_i))\}$, $i = 0, 1, 2, 3$ with the nodes $x_0 = 1/2$, $x_1 = 1$, $x_2 = 3/2$, and $x_3 = 2$. Use the free boundary conditions $S''(x_0) = 0$ and $S''(x_3) = 0$. Plot f and the natural cubic spline interpolant on the same coordinate system.   **[5 Marks]**

Note: The program and output files should be submitted on or before the due date. No submission will be accepted after the due date. Do mention your Name and Roll no. in both the files.