

Assignment 3

MAS365 Introduction to Numerical Analysis
Prof. Chang-Ock Lee

Fall 2021
Due date: November 15 (Mon), 2021

Note: Put your computer assignment in KLMS before the beginning of the class. If you did computer programming work, hand in your code and results in KLMS before the beginning of the class, too. For the plotting work, use MATLAB.

1. Write a program to find the Newton interpolating polynomial P that interpolates the Runge function

$$f(x) = \frac{1}{1 + 25x^2}$$

- at 11 equally spaced nodes in the interval $[-1, 1]$. Use any graphic software to see the plots of $P(x) - f(x)$ at 51 equally spaced points on the interval $[-1, 1]$.
2. Let S be the natural cubic spline that interpolates the Runge function at 11 equally spaced nodes in the interval $[-1, 1]$. Write a computer program to evaluate $S(x) - f(x)$ at 51 equally spaced points on the interval $[-1, 1]$. This is the same problem as Problem 3. Compare the results to discuss the difference.
 3. Derive Simpson's Three-Eighths rule with error term.
 4. Find the integral

$$\int_0^1 s\sqrt{1-s} ds$$

with four decimal place accuracy, using the following methods.

- (a) The composite trapezoidal rule.
- (b) The composite Simpson's rule.

Compare the costs and efficiencies of two methods.