

Homework #5

Problem 1: Interpolation using Lagrange polynomials

You are given the follow data set from an experiment:

x	f(x)
1	10
4	5
6	2
9	1

Use Lagrange polynomials to interpolate at the points $x = 3$, $x = 5$, and $x = 7$.

Problem 2: Numerical Integration

Using the data from Table 6.12 in the book, compute

$$\int_0^8 c(t) dt$$

using

- a) The trapezoidal rule,
- b) Simpson's 1/3 rule,
- c) Simpson's 3/8 rule.

Hint: You can assume that the concentration remains at zero for any measurements taken after 8 seconds.

Problem 3: Solution of Second Order ODE

Consider the following ODE:

$$\frac{d^2 y}{dt^2} - 7 \frac{dy}{dt} + 12y = 0 \text{ with initial conditions } y(0) = 0, y'(0) = 1.$$

- a) Discretize the equation using a forward difference scheme with step size of magnitude h . Write the equation and the initial condition in discretized form.
- b) Solve the discretized equation for $h = 0.1$ from $t = 0$ until $t = 2$. Present all intermediate steps (y_0, y_1, y_2 , etc.). Using MATLAB is strongly encouraged.
- c) Plot the solution of the ODE.