Midterm II Practice Problems

CS 323 , Spring 2019

Problem 1 [10+10 points]
Given the data points $(1, 2), (2, 0), (3, 1), (4, -1)$,
a) Find the cubic interpolation polynomial in the Lagrange form. DO NOT SIMPLIFY.

b) Find the cubic interpolation polynomial in the Newton form. DO NOT SIMPLIFY.

Problem 2

Construct a piecewise linear interpolating polynomials for the function

$$f(x) = \sin x, \text{ at } x_0 = 0, x_1 = \pi/2, x_2 = \pi,$$

and find a bound for the absolute error on the interval $[0, \pi]$.

Problem 3 Let $f(x) = \frac{1}{1+x^2}$ defined on the interval $[-2, 2]$.
a) Approximate the integral $\int_{-2}^{2} f(x)dx$ by Trapezoid method T_4 with 4 equally spaced subintervals.

b) Approximate the integral $\int_{-2}^{2} f(x)dx$ by Simpson method S_2 with 2 equally spaced subintervals.

Problem 4 Let $f(x)$ be a cubic polynomial defined on interval $[-1, 1]$. Determine a Gaussian intergration formula with minimal number of nodes such that the integral formula

$$\sum_{i=0}^{n} f(x_i)w_i$$

is exact for cubic polynomials.