

Name: _____

MATH 330

2nd Semester 2020-2021

Number: _____

Second Exam

Each problem worth 5 points

Q#1) Consider the function $f(x) = \frac{1}{x}$ and the data points

(0.1, 10), (0.2, 5), (0.3, 3.33)

Find Lagrange interpolating polynomial $P_2(x)$. Don't Simplify

Q#2) Find an upper bound for the error in the above estimation (in problem 1).

Q#3) Consider the function $f(x) = x^3 - 3x$ and the data points

$(0, 0), (1, -2), (2, 2), (3, 18)$

Find Newton interpolating polynomial $P_3(x)$. Don't Simplify.

Q#4) Without simplifying $P_3(x)$ in the above estimation (in Q#3), what is the relation between $P_3(x)$ and $f(x)$. Explain

Q#5) Derive the normal equations for the best fit of the form $f(x) = Ax^3 + Bx$

Q#6) Find A, B using the normal equations derived above (in Q#5) and the following data.

$(1, -2), (2, 2), (3, 18)$

Q#7) compare the maximum error, average error, and RMS error for the approximation $f(x) = x^3 - 3x$ to the data points $(0, 1)$, $(1, -3)$, $(2, 5)$, $(3, 15)$.

Q#8) Find a suitable Linearization for $f(x) = Cx + Dx^3$ (Don't find C, D)

Q#9) find the clamped cubic spline that interpolates the data $(1, -1), (3, 22)$,

$$f'(1) = 0, f'(3) = 24$$

Q#10) For the data $(1, 2), (3, 4), (5, 2)$

if $L_{2,1}(x) = \frac{3}{4}$ Find x ?