

Sp 95
EGN 3420

Exam 1B

Name _____

SHOW ALL WORK!

Problem 1 (25 pts)

Consider the function $f(x) = 1/x$.

- A) Find the 3rd order truncated Taylor Series Expansion of $f(x)$ about the pt $x_0 = 1/2$.
- B) Use the 3rd order truncated series to estimate $f(x)$ when $x = 0.6$ to 3 places after the decimal point.
- C) Find the true per cent relative error in the answer to Part B) to 2 places after the decimal point.

SHOW ALL WORK!

Problem 2 (25 pts)

Given the function $f(x) = x^3 - \frac{16}{x}$ use the Newton Raphson Method to fill in the

table below. Round all calculations to 4 places after the decimal point, except the last column which should be rounded to 2 places after the decimal point. Stop when the magnitude of the approximate relative error is less than 1% or after 5 iterations, whichever comes first.

i	x_i	$f(x_i)$	$f'(x_i)$	$ e_A , \%$
0	1			
1				
2				
3				
4				
5				

SHOW ALL WORK!

Problem 3 (25 pts)

The data points $(0,1)$, $(1,a)$, $(2,5)$, $(3,19)$ come from an unknown function $f(x)$.

- A) Find the value of “a” if the coefficient b_3 in the Newton Divided Difference Interpolating polynomial $f_3(x)$ is 1.
- B) Find $f_3(x)$.

The table below may help in your solution.

i	x_i	$f(x_i)$	Δ	Δ^2	Δ^3
0	0	1			
1	1	a			
2	2	5			
3	3	19			

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Problem 4 (25 pts)

A quadratic spline fit thru the data points (1,1), (2,3), (3,6) and (4,12) is given below.

$$f(x) = \begin{cases} 2x - 1 & 1 \leq x \leq 2 \\ ax^2 + bx + c & 2 \leq x \leq 3 \\ 2x^2 - 8x + 12 & 3 \leq x \leq 4 \end{cases}$$

Find a, b, and c.