

CSE 330-03

HERMITE INTERPOLATION

A.

x	$f(x)$	$f'(x)$
8.3	17.56492	3.116256
8.6	18.50515	3.151762

1. Find the Lagrange and Hermite basis from the above table.
2. Now construct an approximating polynomial for the following data.

B.

x	$f(x)$	$f'(x)$
0.1	-0.29004996	-2.8019975
0.2	-0.56079734	-2.6159201
0.3	-0.81401972	-2.9734038

1. Find the Lagrange and Hermite basis from the above table.
2. Now construct an approximating polynomial for the following data.
3. The table above was generated using the following function,
 $f(x) = x^2 \cos x - 3x$. Use the polynomial constructed in part 2 to calculate the absolute error at $f(0.18)$.

C.

x	$\ln(x)$	$\frac{1}{x}$
0.40	-0.916291	2.50
0.50	-0.693147	2.00
0.70	-0.356675	1.43
0.80	-0.223144	1.25

Estimate the value of $\ln(0.60)$ using Hermite Interpolation formula.

FLOATING POINT ARITHMETIC

A. Given $\beta=2$, $m=4$, $e_{\min} = -2$, $e_{\max} = 0$.

1. Find out the values that each group represents for the sets of e , and plot them on a number line starting from 0.
2. Calculate the machine epsilon for the problem ϵ_m .

B. Write down the Mathematical notation for **Fixed-point Representation** and **Floating-Point Representation** and explain each term.

Differentiation

- A. Calculate the derivative of $\log_e x$ numerically at $x_0 = 2$ and find the truncation error for the following values of step size using Forward Difference:
- i) $h=1$, ii) $h=0.1$, iii) $h=0.01$, iv) $h=0.001$, v) Based on the calculations, comment on the error and the step size.
- B. If $f(x) = \sin x + 5e^{5.6x}$, then find the forward, backward and central difference approximation for $f'(3)$ with $\Delta x = 0.3$. Also compare the results.
- C. What will be the error term for a central differentiation with higher order derivative $(f''(x))$?