

2-3,-2,-1,0,1,2

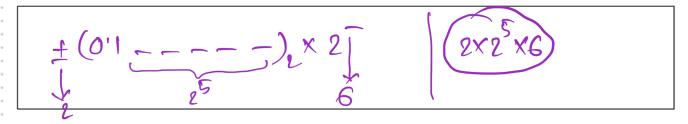
Question 01 [2+1=3] Marks

Consider the following number system, $\beta = 2$, m = 5 and $-3 \le e \le 2$ and answer the following questions.

a. What is the <u>maximum non-negative</u> number that can be represented in this number system? Provide your answer in the original format.

Standard Format	Normalized Format
+ (0, 1 1 1 1 1) x22	+(1.77775

b. How many different numbers can be represented through this system when using the denormalized convention?



Question 02 [1+2=3 Marks]

Consider the following quadratic equation, $x^2 - 70x + 9 = 0$. Below calculate up to 5 significant figures.

a. Find the actual roots of the quadratic equations, using the quadratic formula.

$$\chi = \frac{-(-70) \pm \sqrt{70^{2}-4.1.9}}{2 \times 1} = 35 \pm 8\sqrt{19}$$

$$\alpha = 69.871 \text{ upto 5 sf}$$

$$\alpha = 69.871 \text{ upto 5 sf}$$

$$\alpha = 69.881 \text{ upto 5 sf}$$

b. Show if the roots evaluated in the previous part satisfies the solution if we consider S.F. = 5

According to the polynomial of degree 2, we know,
$$qx\beta = \frac{c}{a} = \frac{9}{1} = 9$$
But, $qx\beta = 9.0001 \neq 9$
So there exists a loss of significance

Quir 02

Consider a function, f(x) $x_i = \{0.3, \pi/2, 2.45\}.$ = $2\sqrt{3} \sin(x)$ and you want to interpolate the function with the nodes

Using the given nodes, determine the degree of the interpolating polynomial using a matrix method and write its general structure accordingly. [1+1=2]

degree,
$$n = 2$$

$$P_{x}(x) = a_0 + a_1 x + a_2 x^{2}$$

b. Consider if the degree was 92, what would be the dimensions of the matrix? [1]

$$(93 \times 93)$$

c. Find the polynomial, $P_{u}(x)$. [2]

$$\begin{bmatrix} a_0 \\ a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} 1 & 0.3 & 0.3^{0} \\ 1 & 11/2 & (11/2)^{0} \\ 1 & 2.45 & 2.45^{0} \end{bmatrix}^{-1} \begin{bmatrix} 1.02591 \\ 5.4641 \\ 2.20925 \end{bmatrix}$$

OUESTION 02

Consider the same function f(x) and nodes x_i .

$$f(x) = 2\sqrt{3} \sin(x) \& x_i = \{0.3, \pi/2, 3\}$$

Now you want to improve the previous method in terms of time complexity.

a. What would be the Method of Polynomial Interpolation? Why? [1]

Lagrange or Newton's devided diff. O(n) < O(n)3) b. Define the polynomial and calculate it accordingly. [4]

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1.1 If a Hermite interpolating polynomial is constructed using x distinct points with both function and derivative values given, what is the maximum possible degree of the polynomial?

D) x+1

- A) x
 - B) 2x 1
- C) 2x

1.2 What is the main advantage of Hermite interpolation over Lagrange interpolation?

- A) Hermite interpolation uses a lower-degree polynomial.
- B) Hermite interpolation provides better approximation for differentiable functions.
- C) Hermite interpolation does not require divided differences.
- D) Lagrange interpolation is always more accurate.

1.3 The divided difference method used in Newton interpolation is extended in Hermite interpolation by incorporating which additional values?

- A) Function values at additional points
- B) Higher-order derivatives
- C) Tangent line equations
- D) Lagrange basis polynomials

Question 02:

Question 02.	76	N(
x	(1)	2
f(x)	2	3
f'(x)	1	2

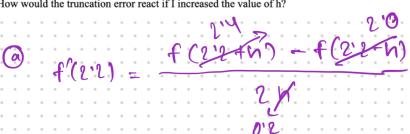
Calculate the hermite basis: $h_1(x)$ (3 Marks)

$$h_{1}(x) = \begin{cases} 1 - 2(x - x_{1}) l_{1}(x_{1})^{2} l^{2}(x) \end{cases}$$

$$= \{1-2(N-1)\}(N-1)$$

Question of Constant in	Tono wang damasen.		
x	2.0	2.2	2.4
f(x)	1.6212	1.9800	2.5349

- (a) (3 marks) Using the above data, compute f'(2, 2) using the central difference method.
- (b) (1 Marks) How would the truncation error react if I increased the value of h?



- 1,(x)=2-1=2-1
- ((n) = L

m = 012

2'2842

b) As TEXN

ht -> TP1