ASSIGNMENT 2 (NUMERICAL ANALYSIS)

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SEC "A"

Question 1-

i) Compare the two solutions.

$$x = g(x)$$

$$x = 1 + x - \frac{x^2}{4}$$

Rearranging the above equation to find the fixed point

$$x^2 = 4$$

$$x = \pm 2$$

Hence the fixed point are $+2, -2$

(ii) Write the property that the fixed point iteration process will converge to a fixed point.

To converge the iteration method we consider an interval $[a\ b]$ in which the root lies. The iteration method converge if $|g'(x)| <$ whenever, $x \in [a, b]$.

(iii) what will be happen when $g'(x)=1$

if $g'(x)=1$ then the given iteration method cannot converge in general. Because the error term may vanish or may not vanish increasing the number of iteration.

iv) From the table discuss converging/diverging behaviour of iteration for both cases.

For Case I

$$g'(x) = 1 - \frac{x}{2}$$

when $-3 \leq x \leq -1$ $\quad \frac{3}{2} < |g'(x)| < \frac{5}{2}$ and

so $|g'(x)| > 1$ and so the method is not convergent.

For Case II

when $1 < x < 2$ $|g'(x)|$ varies from 0 to $\frac{1}{2}$ and so $|g'(x)| < 1$ and hence the iteration converge to 2

Q2)

1- Compute Specific heat Capacity C_p at $T = 1300$.

By Newton's Forward Difference table

T	H	ΔH	$\Delta^2 H$	$\Delta^2 H$	$\Delta^3 H$
800	1305	.		.	
			.		
1000	1460	1460 - 1305 =			
		155	.	.	
1200	1585	1585 - 1460 =	125 - 155 =		
		125	- 30	.	
1400	1705	1705 - 1585 =	120 - 125 =	-5 - (-30) =	
		120	-5	25	
1606	1825	1825 - 1705 =	120 - 120 = 0	0 - (-5) =	
		120		5	
					.
					.
					.
					.
					.
					5 - 25 = -20

Apply Newton's Forward difference Table.

$$f(\bar{i}) = H_0 + \frac{1}{h}(\bar{i}-\bar{i}_0)\Delta H_0 + \frac{1}{2!h^2}(\bar{i}-\bar{i}_0)(\bar{i}-\bar{i}_1)\Delta^2 H_0 + \frac{1}{3!h^3}(\bar{i}-\bar{i}_0)(\bar{i}-\bar{i}_1)(\bar{i}-\bar{i}_2)\Delta^3 H_0 + \frac{1}{4!h^4}(\bar{i}-\bar{i}_0)(\bar{i}-\bar{i}_1)(\bar{i}-\bar{i}_2)(\bar{i}-\bar{i}_3)\Delta^4 H_0$$

$$h = x_1 - x_0 = x_2 - x_1 = \cdots\cdots = x_n - x_{n-1}$$

$$h = 1000 - 800 = 200$$

Put values from table

$$F(1300) = 1305 + \frac{1}{200}(1300-800)155 + \frac{1}{2(200)^2}(1300-800)(1300-1000)(-30) + \frac{1}{6(200)^3}(1300-800)(1300-100)(1300-1000)(25) + \frac{1}{24(200)^4}(1300-800)(1300-1000)(1300-1200)(1300-1400)(-20)$$

$$F(1300) = 1305 + \frac{500}{200}(155) + \frac{1}{2(40000)}(500)(300)(-30) + \frac{1}{6(8\times10^6)}(500)(300)(100)(25) + \frac{(500)(300)(100)(-100)(-20)}{24(1.6\times10^9)}$$

$$F(1300) = 1305 + 387.5 - 112.5 + 7.8125 + 0.78125$$

$$\boxed{F(1300) = 1588.59375}$$