

H.W Lagrange Interpolation

2) x 7 8 9 10

$f(x)$ 3 1 1 9

find y at $x = 9.5$

$$f(x) = \frac{(9.5-8)(9.5-9)(9.5-10)(1)}{(7-8)(7-9)(7-10)}(3) +$$

$$\frac{(9.5-7)(9.5-9)(9.5-10)(1)}{(8-7)(8-9)(8-10)}(1) +$$

$$- \frac{(9.5-7)(9.5-8)(9.5-10)(1)}{(9-7)(9-8)(9-10)}(1) +$$

$$\frac{(9.5-7)(9.5-8)(9.5-9)(9)}{(10-7)(10-8)(10-9)}(9)$$

$$= \frac{9.5 \times 0.5 \times -0.5 \times 3}{-1 \times -2 \times -3} + \frac{(2.5)(1.5)(-0.5)(1)}{(1) \times (-1) \times (-2)}$$

$$= \frac{(2.5)(1.5)(-0.5)(1)}{(2)(1)(-1)} + \frac{(2.5)(1.5)(0.5)(9)}{(3)(2)(1)}$$

$$= 0.125 + 8 - 0.3125 + 0.9375 + 2.8125$$

$$= 3.625 \text{ Ans}$$

2)	4	3	7	9	10
		168	120	72	63

at $n=8$

$$f(6) = \frac{(6-7)(6-9)(6-10)}{(3-7)(3-9)(3-10)} (168) +$$

$$= \frac{(6-3)(6-9)(6-10)}{(7-3)(7-9)(7-10)} (120) +$$

$$= \frac{(6-3)(6-7)(6-10)}{(9-3)(9-7)(9-10)} (72) +$$

$$= \frac{(6-3)(6-7)(6-9)}{(10-3)(10-7)(10-9)} (63)$$

$$f(6) = \frac{-2x-3x-4}{-9x-6x-7} \times (168) + \frac{3x-3x-4 \times 60}{4x-2x-3}$$

$$= \frac{73x-1x-4}{6 \times 2x-1} (72) + \frac{3x-1x-3 \times 63}{7 \times 3 \times 2}$$

$$= 12 + 180 - 72 + 27$$

$$= 147$$

3)

$$n \quad 1 \quad 2 \quad 7 \quad 8$$

$$f(n) \quad 4 \quad 8 \quad 5 \quad 4$$

$$f(6) = \frac{(6-2)(6-7)(6-8)}{(1-2)(1-7)(1-8)} (4) +$$

$$\frac{(6-1)(6-7)(6-8)}{(2-1)(2-7)(2-8)} (5) +$$

$$\frac{(6-1)(6-2)(6-8)}{(7-1)(7-2)(7-8)} (5) +$$

$$\frac{(6-1)(6-2)(6-7)}{(7-1)(8-2)(8-7)} (4)$$

$$= \frac{4x - 1x - 2x^4}{-1x - 6x - 7} + \frac{5x - 1x - 2x^5}{1x - 8x - 6} +$$

$$\frac{5x^4x - 2x^5}{6x^8x - 1} + \frac{5x^4x - 1x^4}{7x^6x^1}$$

$$= \frac{-32}{42} + \frac{50}{30} + \frac{40}{6} + \frac{-80}{42}$$

$$= -0.76190 + 1.66667 + 6.66667 + -1.90476$$

$$= 5.666678 \text{ Ans}$$

Regular - Falsi Method

1) $u^3 + u - 1 = 0$

x	y	
0.5	-0.375	$x = \frac{x_1 y_2 - y_1 y_2}{y_2 - y_1}$
0.6 (u_1)	-0.184 (y_1)	
0.7 (u_2)	0.043 (y_2)	$x_0 = \frac{0.6(0.043) - (0.7)(-0.184)}{0.043 + 0.184}$
0.8	0.312	$x_0 = 0.68106$
0.9	0.629	$y_0 = -0.0030$
1	1	

2) $w^3 - 2w + 0.5 = 0$

x	y	
0 (x_1)	0.5 (y_1)	$x_0 = \frac{-0.5}{-1.0} = 0.5$
1 (x_2)	-0.5 (y_2)	$y_0 = -1.375$
0.5 (x_0)	0.5 -0.375 (y_0)	$y_3 = -0.048$
	0.5 (y_1)	$x_4 = 0.26068$
0 (x_1)		$x_3 = \frac{0.25}{0.875} = 0.28571$
		$y_4 = -0.0036$
(0.28571) (x_3)	(-0.048) (y_3)	
	0.5 (y_1)	

$$3) \quad x^3 + 2x - 20 = 0$$

X	Y
2	-8
2.1	-6.539
2.2	-4.952
2.3	-3.233
2.4(x ₁)	-1.376(y ₁)
2.5(x ₂)	0.625(y ₂)

$$x_0 = 2.4687656 \quad y_0 = 6.015827$$

$$x_2 = 2.5 \quad y_2 = 0.625$$

$$x_3 = 2.46953702$$

$$y_3 = -0.0001752$$

$$4) \quad 3x - \cos x - 1 = 0$$

X	Y
0(x ₁)	-2(y ₁)
(x ₂)	0.000152(y ₂)

$$x = \frac{-2}{3.000152} = 0.6663289$$

$$y_0 = -0.000633692$$

$$5) \quad x^3 - 3x - 5$$

X	Y
2.1	-2.039
2.2(x ₁)	-0.952(y ₁)
2.3(x ₂)	0.267(y ₂)

$$x_0 = 2.2781$$

$$x_2 = 2.3$$

$$x_3 = 2.2790$$

$$y_0 = -0.011559$$

$$y_2 = 0.267$$

$$y_3 = -0.000236$$