

Memorik-1

Lagrange's Interpolation :

i)

x	7	8	9	10
y(x)	3	1	1	9

find y at $x = 9.5$

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

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

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

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

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

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

$$= 0.1875 - 0.3125 + 0.9375 + 2.8125$$
$$= 3.625$$

2) n

3 7 9 10
168 120 72 63

at $n = 6$

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

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

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

$$(6-3)(6-7)(6-9)$$

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

$$6(6) = \frac{-2x - 3x - 4}{-7x - 6x - 7} \times 168 + \frac{3x - 3x - 4x + 20}{4x + 2x - 3} \times 120$$

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

$$= 12 + 186 - 72 + 27$$

$$= 147 \quad \underline{\text{Ans}}$$

3)	n	1	2	7	8
	$y(n)$	4	8	5	4

find $f(6)$

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

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

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

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

$$= \frac{4 \times -1 \times -2 \times 4}{-1 \times -6 \times -7} + \frac{5 \times -1 \times -2 \times 5}{1 \times -5 \times -6} +$$

$$\frac{5 \times 4 \times -2 \times 5}{6 \times 5 \times -1} + \frac{5 \times 4 \times -1 \times 4}{7 \times 6 \times 1}$$

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

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

$$= 5.666678 \text{ Ans}$$

Regular Falsi Method

$$1) x^3 - x - 1 = 0$$

X	Y
0.5	-0.375
0.6(x ₁)	-0.184(y ₁)
0.7(x ₂)	0.043(y ₂)
0.8	0.312
0.9	0.629
1	1

$$X = \frac{X_1 y_2 - X_2 y_1}{y_2 - y_1}$$

$$X_0 = \frac{0.6(0.043) - (0.7)(-0.184)}{0.043 + 0.184}$$

$$X_0 = 0.68106$$

$$Y_0 = -0.0030$$

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

X	Y
0(x ₁)	0.5(y ₁)
1(x ₂)	-0.5(y ₂)
0.5(x ₀)	-3.75(y ₀)
0(x ₁)	0.5(y ₁)

$$X_0 = \frac{-0.5}{-1.0} = 0.5$$

$$Y_0 = -3.75$$

$$Y_3 = -0.048$$

$$X_3 = \frac{0.25}{0.875} = 0.28571$$

$$(0.28571)(x_3) \quad (-0.048)(y_3)$$

$$0(x_1)$$

$$0.5(y_1)$$

$$X_4 = 0.26068$$

$$Y_4 = -0.0036$$

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

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)

$$X_0 = 2.4687656$$

$$Y_0 = -0.615827$$

$$X_2 = 2.5$$

$$Y_2 = 0.625$$

$$X_3 = 2.46953702 \text{ (Ans)}$$

$$Y_3 = -0.0001752$$

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

$x \quad y$

$$0 \quad (x_1) \quad -2(y_1)$$

$$1 \quad (x_2) \quad 1.000152(y_2)$$

$$X_0 = \frac{2}{3.000152} = 0.666632891 \text{ (Ans)}$$

$$Y_0 = -0.000033692$$

~~0~~ +

~~2.0002~~

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

$X \quad Y$

$$2.1 \quad -2.039$$

$$2.2(X_1) \quad -0.952(Y_1)$$

$$2.3(X_2) \quad 0.267(Y_2)$$

$$X_0 = 2.2781$$

$$X_2 = 2.3$$

$$X_3 = 2.2790$$

$$Y_0 = -0.011559$$

$$Y_2 = 0.267$$

$$Y_3 = -0.000236$$