

1.

$$y = f(x)$$

$$(7, 3), (8, 1), (9, 1) \text{ \& } (10, 9)$$

y at $x = 9.5$

Here,

x	7	8	9	10	9.5
f(x)	3	1	1	9	?

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

$$= \frac{(1.5)(.5)(-0.5)(3)}{(-1)(-2)(-3)} + \frac{(2.5)(0.5)(-0.5)}{(1)(-1)(-2)} + \frac{(2.5)(1.5)(0.5)}{(2)(1)(-1)} + \frac{(2.5)(1.5)(0.5)(9)}{(3)(2)(1)}$$

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

$$= \underline{\underline{3.625}}$$

2.

2.	x	3	7	9	10	6
	f(x)	168	120	72	63	?

$$f(6) = \frac{(6-3)(6-7)(6-9)(63)}{(10-3)(10-7)(10-9)} + \frac{(6-3)(6-7)(6-10)72}{(9-3)(9-7)(9-10)} \\ + \frac{(6-3)(6-9)(6-10)(120)}{(7-3)(7-9)(7-10)} + \frac{(6-7)(6-9)(6-10)168}{(3-7)(3-9)(3-10)}$$

$$= 124180 - 72 + 27$$

$$\approx \underline{\underline{147}}$$

3.	x	1	2	7	8	6
	f(x)	4	5	5	4	?

$$f(6) = \frac{(6-1)(6-2)(6-7)(4)}{(8-1)(8-2)(8-7)} + \frac{(6-1)(6-2)(6-8)(5)}{(7-1)(7-2)(7-8)} +$$

$$\frac{(6-1)(6-7)(6-8)(5)}{(2-4)(2-7)(2-8)} + \frac{(6-2)(6-7)(6-8)4}{(1-2)(1-7)(1-8)}$$

$$\approx 0.7619048 + 1.6666667 + 6.666667 \\ - 1.9047619$$

$$\approx \underline{\underline{5.667}}$$

4.

x	1	2	3	4	7	5
$f(x)$	2	4	8	16	128	?

$$f(5) = \frac{(5-1)(5-2)(5-3)(5-4)(128)}{(7-1)(7-2)(7-3)(7-4)} + \frac{(5-1)(5-2)(5-3)(5-7)(16)}{(4-1)(4-2)(4-3)(4-7)} + \frac{(5-1)(5-2)(5-4)(5-7)(4)}{(3-1)(3-2)(3-4)(3-7)} + \frac{(5-3)(5-4)(5-7)(4)}{(2-1)(2-3)(2-4)(2-7)} + \frac{(5-2)(5-3)(5-4)(5-7)(2)}{(1-2)(1-3)(1-4)(1-7)}$$

$$= -0.6666667 + 6.4 - 24 + 42.6666667 + 8.533333$$

$$= \underline{\underline{32.934}}$$

5.

x	10	20	14	16	15
$f(x)$	0.25	0.2	0.15	0.1	?

$$f(15) = \frac{(15-10)(15-20)(15-14)(0.1)}{(16-10)(16-20)(16-14)} + \frac{(15-10)(15-20)(15-16)(0.15)}{(14-10)(14-20)(14-16)} + \frac{(15-10)(15-14)(15-16)(0.2)}{(20-10)(20-14)(20-16)} + \frac{(15-20)(15-14)(15-16)(0.25)}{(10-20)(10-14)(10-16)}$$

$$= -0.0052083 - 0.0041667 + 0.078125 + 0.057038$$

$$= \underline{\underline{0.120633}}$$

HW-2

1. $x^3 + x - 1 = 0$

$$0.5 < x < 1$$

x	y
0.5	-0.0375
0.6 (x_0)	-0.184 (y_0)
0.7 (x_1)	0.043 (y_1)

$$\begin{aligned} x_2 &= \frac{(0.6)(0.043) - (0.7)(-0.184)}{0.043 - (-0.184)} \\ &= \underline{0.681057} \text{ now } (y_0) \rightarrow \underline{0.030418} \end{aligned}$$

$$\begin{aligned} x_3 &= \frac{(0.681057)(0.043) - (0.7)(0.030418)}{(0.043) - (-0.030418)} \\ &= 0.682304848 \end{aligned}$$

$$y_3 = \underline{-0.000055037}$$

$$\text{root} = x = \underline{0.682304849}$$

2. $f(x) = x^3 - 2x + 0.5 = 0$
 $0 < x < 1$

x	y
0.1	0.801
0.2 (x_0)	0.108 (y_0)
0.3 (x_1)	-0.073 (y_1)

$$x_2 = \frac{(0.2)(-0.073) - (0.3)(0.108)}{-0.073 - (0.108)}$$

$$= -0.2596685085$$

$$y_2 = -0.001828168 \text{ now } (y_1)$$

$$x_3 = \frac{(0.2)(-0.001828168) - (-0.2596685085)(0.108)}{-0.001828168 - 0.108}$$

$$= 0.2586748737$$

$$y_3 = -0.000041149$$

The root is 0.2586748737

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

$$2 < x < 2.5$$

x	y
2.3	-3.233
2.4 (x_0)	-1.376 (y_0)
2.5 (x_1)	0.625 (y_1)

$$x_2 = \frac{(2.4)(0.625) - (2.5)(-1.376)}{0.625 - (-1.376)}$$

$$= \frac{2.4687656172}{-0.0158270173} \text{ (new } y_0)$$

$$x_3 = \frac{(2.4687656172)(0.625) - (2.5)(-0.0158270173)}{0.625 - (-0.0158270173)}$$

$$= \frac{2.469537058}{-0.0001747938}$$

$$y_3 = -0.0001747938$$

$$\text{root} = x \text{ at } \underline{\underline{2.469537058}}$$

4. $f(x) = 3x - \cos x - 1 = 0$

x	y
0.5	-0.4999 619231
0.6 (x_0)	-0.1999 451694 (y_0)
0.7 (x_1)	0.10007 46303 (y_1)

$$x_2 = \frac{(0.6)(0.1000746303) - (0.7)(-0.1999451694)}{0.1000746303 - (-0.1999451694)}$$

$$= 0.6666439914$$

$$y_2 = -0.0000003387$$

the root = $x = 0.6666439914$

5. $x^3 - 3x - 5$
 $2 < x < 2.5$

x	y
2.1	-2.039
2.2 (x_0)	-0.952 (y_0)
2.3 (x_1)	0.267 (y_1)

$$x_2 = \frac{(2.2)(0.267) - (2.3)(-0.952)}{(0.267) - (-0.952)}$$

$$= 2.2780968007$$

$$y_2 = -0.0715944071 \text{ new } (y_0)$$

$$x_3 = \frac{(2.278096 \times 0.287) - (2.3)(-0.011954)}{0.287 - (-0.011954)}$$

$$y_3 = \frac{2.279011107}{0.00009661}$$

The root at $x = \underline{\underline{2.279011107}}$

6. $f(x) = x \log_{10} x - 1.2$
 $2 < x < 3$

x

2.6

2.7 (x_0)

2.8 (x_1)

y

-0.1210692953

-0.0353178 (y_0)

0.0520424 (y_1)

$$x_2 = \frac{(2.7)(0.0520424) - (2.8)(-0.0353178)}{0.0520424 - (-0.0353178)}$$

$$= 2.792154119$$

$$y_2 = 0.04573149 \text{ now } y_0$$

$$x_3 = \frac{2.7(0.04573149) - (2.792154119)(0.0353178)}{0.04573149 - (-0.0353178)}$$

$$= \underline{\underline{2.740456302}}$$

$$y_3 = \underline{\underline{-0.00016552}}$$

So root at $x = \underline{\underline{2.740456302}}$