

Homework - 1

Q1.

x	7	8	9	10	9.5
y	3	1	1	9	3.625

$$y = f(x) = \frac{(x-x_1)(x-x_2)(x-x_3)}{(x_0-x_1)(x_0-x_2)(x_0-x_3)} f_0 + \dots + \frac{(x-x_0)(x-x_1)(x-x_2)}{(x_3-x_0)(x_3-x_1)(x_3-x_2)} f_3$$

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

$$= \frac{1.125}{6} + \frac{(-0.625)}{2} + \frac{1.875}{2} + \frac{16.875}{6}$$

$$= \frac{18}{6} + \frac{1.25}{2} = 3 + 0.625 = \underline{\underline{3.625}}$$

Q2.

x	3	7	9	10	6
y	168	120	72	63	147

$$y = f(x) = \frac{(+1)(+3)(+1)(168)}{(+1)(+6)(+7)} + \frac{3(+3)(+1)(120)}{4(+7)(+8)} + \frac{7(+1)(-4)(72)}{(+1)(6)(2)} + \frac{8(+1)(+3)(63)}{(-1)(8)(1)}$$

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

$$= \underline{\underline{147}}$$

Q3.

x	1	2	7	8	6
y	4	5	5	4	5.6667

$$\begin{aligned}
 y = f(x) &= \frac{4(1)(4)(1)(4)}{(-1)(+6)(+7)} + \frac{5(1)(+2)(8)}{1(+8)(+6)} + \frac{5(4)(+2)(5)}{(6)(8)(+1)} \\
 &\quad + \frac{5(4)(-1)(4)}{(7)(6)(1)} \\
 &= \frac{-16}{21} + \frac{5}{3} + \frac{20}{3} - \frac{40}{21} \\
 &= \frac{25}{3} - \frac{56}{21} = \frac{175 - 56}{21} = \frac{119}{21} = 5.6667
 \end{aligned}$$

Q4.

x	1	2	3	4	7	5
y	2	4	8	16	128	

$$\begin{aligned}
 y = f(x) &= \frac{(3)(2)(1)(-2)(2)}{(+1)(+7)(+8)(+6)} + \frac{(4)(2)(1)(+2)(4)}{1(+1)(+7)(+5)} \\
 &\quad + \frac{8(4)(3)(1)(+2)}{(1)(2)(-1)(+4)} + \frac{(4)(2)(8)(+2)(16)}{(8)(7)(1)(+3)} \\
 &\quad + \frac{128(4)(2)(8)(1)}{(6)(5)(4)(8)} \\
 &= \frac{-2}{3} + \frac{32}{5} - 24 + \frac{128}{3} + \frac{128}{15} \\
 &= \frac{128 + 288 + 316 - 360}{15} = \frac{366}{15} = 24.4
 \end{aligned}$$

Q5.

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x	10	14	16	20	15
y	0.25	0.15	0.10	0.2	

$$y = f(x) = \frac{(1)(+1)(+5)(0.25)}{(+4)(+6)(-16)} + \frac{5(+1)(+5)(0.05)}{4(+2)(+6)}$$

$$+ \frac{(0.10)(5)(1)(+5)}{(6)(2)(+4)} + \frac{(0.2)(8)(1)(-2)}{10(6)(4)}$$

$$= \frac{-0.25}{48} + \frac{1.25}{16} + \frac{2.5}{48} - \frac{0.1}{24}$$

$$= \frac{2.25}{48} + \frac{0.4}{24} = \frac{1.25 + 0.4}{24}$$

$$= \frac{1.525}{24} = \frac{2.25}{48} + \frac{2.4}{24}$$

$$= \underline{\underline{0.146875}} = \underline{\underline{0.12083}}$$

Homework = 2Q1.

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

x	0.5	0.6	0.7
y	-0.375	-0.184	0.043

$$x' = \frac{x_1 y_2 - x_2 y_1}{y_2 - y_1}$$

$$= \frac{(0.6)(0.043) - (0.7)(-0.184)}{0.043 - (-0.184)} = 0.681$$

$$y' = (0.681)^3 + 0.681 - 1 = -0.00377876$$

$$\underline{\underline{\text{root} = 0.681}}$$

Q2.

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

x	0	0.1	0.2	0.3
y	0.5	0.301	0.108	-0.075

$$x' = \frac{(0.2)(-0.075) - (0.3)(0.108)}{-0.075 - 0.108} = 0.2597$$

$$y' = (0.2597)^3 - 2(0.2597) + 0.5 = -0.0018484$$

$$\underline{\underline{\text{root} = 0.2597}}$$

Q3.

$$x^3 + 2x - 20 = 0$$

x	2	2.1	2.2	2.3	2.4	2.5
y	-8	-0.531	-4.952	-8.24	-1.876	0.625

$$x' = \frac{(2.4)(0.625) - (2.5)(-1.376)}{0.625 - (-1.376)} = 2.46876$$

$$y' = (2.46876)^3 + 2(2.46876) - 20 = -0.015827$$

$$\underline{\underline{\text{root} = 2.4695}}$$

Q4. $3x - \cos x - 1 = 0$

x	y
0	-2
0.1	-1.699
0.2	-1.399
0.3	-1.099
0.4	-0.799
0.5	-0.499
0.6	-0.199
0.7	0.1

$$x' = \frac{(0.6)(0.1) - (0.7)(-0.199)}{0.1 - (-0.199)}$$

$$= 0.6645$$

$$y' = 3(0.6645) - \cos(0.6645) - 1 = -0.00623$$

$$\underline{\underline{\text{root} = 0.6645}}$$

Q5. $x^3 - 3x - 5 = 0$

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

$$= 2.2781$$

x	y
2	-3
2.1	-2.039
2.2	-0.952
2.3	0.267

$$y' = (2.2781)^3 - 3(2.2781) - 5 = -0.01159$$

$$x'' = \frac{(2.2781)(0.267) - (2.3)(-0.01159)}{0.267 - (-0.01159)} = 2.279$$

$$y'' = (2.279)^3 - 3(2.279) - 5 = -0.0000368$$

root = 2.279

Q6. $x \log_{10} x - 1.2 = 0$

$$x' = \frac{2.7(0.052) - 2.8(-0.0353)}{0.052 - (-0.0353)}$$

$$= 2.7404$$

x	y
2	-0.5979
2.1	-0.5233
2.2	-0.4467
2.3	-0.3680
2.4	-0.2875
2.5	-0.2052
2.6	-0.1211
2.7	-0.0353
2.8	0.052

$$y' = (2.7404)(\log_{10} 2.7404) - 1.2$$

$$= -0.0001839$$

root = 2.7404

Q7 $x^3 - 4x + 1 = 0$

$$x' = \frac{1(1) - 2(-2)}{1 - (-2)} = 1.667$$

x	y
0	1
1	-2
2	1

$$y' = (1.667)^3 - 4(1.667) + 1 = -1.037$$

$$x'' = \frac{(1.667)(1) - (2)(-1.037)}{1 - (-1.037)} = \frac{1.8365}{1.037} = 1.8365$$

$$y'' = (1.8365)^3 - 4(1.8365) + 1 = -0.152$$

$$x''' = \frac{(1.8365)(1) - (-0.152)(2)}{1 - (-0.152)} = 1.858$$

$$y''' = (1.858)^3 - 4(1.858) + 1 = -0.017879288$$

$$\text{root} = \underline{\underline{1.858}}$$

Q8 $x^3 + 2x^2 - 8 = 0$

$$x' = \frac{(1.5)(8) - 2(-0.125)}{8 - (-0.125)} = 1.50769$$

x	y
0	-8
1	-5
1.5	-0.125
2	8

$$y' = (1.50769)^3 + 2(1.50769)^2 - 8 = -0.02654$$

$$x'' = \frac{(1.50769)(8) - 2(-0.02654)}{8 - (-0.02654)} = 1.5093$$

$$y'' = (1.5093)^3 + 2(1.5093)^2 - 8 = -0.005262$$

$$\text{root} = \underline{\underline{1.5093}}$$

Q9. $x^3 - 9x + 1 = 0$

$$x' = \frac{(2.9)(1) - 3(-0.711)}{1 - (-0.711)}$$

$$= 2.9415$$

$$y' = (2.9415)^3 - 9(2.9415) + 1$$

$$= -0.02147$$

x	y
0	1
1	-7
2	-9
2.5	-5.875
2.9	-0.711
3	1

$$x'' = \frac{(2.9415)(1) - (3)(-0.02147)}{1 - (-0.02147)} = 2.9427$$

$$y'' = (2.9427)^3 - 9(2.9427) + 1 = -0.0015$$

root = 2.9427

Q10. $x^3 - x - 4 = 0$

x	y
0	-4
1	-4
1.5	-2.125
1.6	-1.504
1.7	-0.787
1.8	0.032
2	2

$$x' = \frac{(1.7)(0.032) - (1.8)(-0.787)}{0.032 - (-0.787)} = 1.7961$$

$$y' = (1.7961)^3 - 1.7961 - 4 = -0.00199$$

$$x'' = \frac{(1.7961)(0.032) - (1.8)(-0.00199)}{0.032 - (-0.00199)}$$

$$= 1.7964$$

$$y'' = (1.7964)^3 - 1.7964 - 4 \\ = -0.0000278$$

$$\underline{\underline{\text{root} = 1.7964}}$$