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FY Sem 2

Numerical Methods & Algebra H/W 1

1.

x	y
7	3
8	1
9	1
10	9

x	7	8	9	10
y	3	1	1	9

$$f(9.5) = \frac{1.5 \times 0.5 \times (-0.5)}{-1 \times -2 \times -3} \times 3 = \frac{3}{16}$$

$$+ \frac{2.5 \times 0.5 \times (-0.5)}{1 \times (-1) \times (-2)} \times 1 = \frac{-5}{16}$$

$$+ \frac{2.5 \times 1.5 \times (-0.5)}{2 \times (1) \times (-1)} \times 1 = \frac{15}{16}$$

$$+ \frac{2.5 \times 1.5 \times 0.5}{3 \times 2 \times 1} \times 9 = \frac{45}{16}$$

$$\therefore f(9.5) = \frac{29}{8} = 3.625$$

2.

x	y
3	168
7	120
9	72
10	63

x	3	~~4~~	7	9	10
y	168	~~120~~	120	72	63

$$f(6) = \frac{-1 \times (-3) \times (-4)}{-4 \times -5 \times -6} \times 168 = \frac{84}{5}$$

$$+ \frac{3 \times (-3) \times (-4)}{4 \times (-2) \times (-3)} \times 120 = 180$$

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

$$+ \frac{3 \times (-1) \times (-3)}{7 \times 3 \times 1} \times 63 = 27$$

$$f(6) = 151.8$$

3.

1 4
2 5
7 5
8 4

x	1	2	7	8
y	4	5	5	4

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

$$= \frac{-16}{21} + \frac{5}{3} + \frac{20}{3} + \frac{-40}{21}$$

$$f(6) = \frac{17}{3} = 5.6667$$

4.

1 2
2 4
3 8
4 16
7 128

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

$$f(5) = \frac{3\times 2\times 1\times(-2)}{-1\times-2\times-3\times-4}\times 2 + \frac{4\times 2\times 1\times(-2)}{1\times-1\times-2\times-5}\times 4 + \frac{4\times 3\times 1\times(-2)}{2\times 1\times(-1)\times(-4)}\times 8 + \frac{4\times 3\times 2\times(-2)}{3\times 2\times 1\times(-3)}\times 16 + \frac{4\times 3\times 2\times 1}{6\times 5\times 4\times 3}\times 128$$

$$= -\frac{2}{3} + \frac{32}{5} + (-24) + \frac{128}{3} + \frac{128}{15}$$

$\therefore f(5) = 32$

5.

x	y
10	0.25
14	0.15
16	0.10
20	0.2

x	10	14	16	20
y	0.25	0.15	0.10	0.2

$$f(15) = \frac{1\times(-1)\times(-5)}{-4\times(-6)\times(-10)}\times 0.25 = -\frac{1}{192}$$

$$+\frac{5\times(-1)\times(-5)}{4\times(-2)\times(-6)}\times 0.15 = \frac{5}{64}$$

$$+\frac{5\times 1\times(-5)}{6\times 2\times(-4)}\times 0.10 = \frac{5}{96}$$

$$+\frac{5\times 1\times(-1)}{10\times 6\times 4}\times 0.2 = -\frac{1}{240}$$

$$f(15) = \frac{29}{240} = 0.1208333$$

H/W 2

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

x	y
0.5	-0.375
0.6	-0.184
0.7	0.043
0.8	0.312
0.9	0.629
1.0	1

$x_1 = 0.6$ $\quad y_1 = -0.184$

$x_2 = 0.7$ $\quad y_2 = 0.043$

$$x_4 = \frac{0.6(0.043) - 0.7(-0.184)}{0.043 + 0.184}$$

$x_4 = 0.681057$

$y_4 = -0.003042$

$x_1 = 0.681057$ $\quad y_1 = -0.003042$

$x_2 = 0.7$ $\quad y_2 = 0.043$

$$x_4 = \frac{0.681057(0.043) - 0.7(-0.003042)}{0.043 + 0.003042}$$

$x_4 = 0.682308$

$y_4 = -0.0000047$

∴ The root of equation $x^3 + x - 1$ is 0.682308

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

x	y
0	0.5
0.1	0.301
0.2	0.108
0.3	-0.073
0.4	-0.236
0.5	-0.375
0.6	-0.484
0.7	-0.557
0.8	-0.588
0.9	-0.571
1.0	-0.5

$x_1 = 0.2$ $y_1 = 0.108$

$x_2 = 0.3$ $y_2 = -0.073$

$$x_4 = \frac{0.2(-0.073) - 0.3(0.108)}{-0.073 - 0.108}$$

$x_4 = 0.2596685$

$y_4 = -0.00182814$

$x_1 = 0.2596685$ $y_1 = -0.00182814$

$x_2 = 0.3$ $y_2 = -0.073$

$$x_4 = \frac{0.2596685(-0.073) - 0.3(-0.00182814)}{-0.073 + 0.00182814}$$

$x_4 = 0.2461938$

$y_4 = 0.022534$

$x_1 = 0.2$ $y_1 = 0.108$

$x_2 = 0.2596685$ $y_2 = -0.001828$

$$x_4 = \frac{0.2(-0.00182814) - 0.2596685(0.108)}{-0.00182814 - 0.108}$$

$x_4 = 0.2586753$

$y_4 = -0.00004$

∴ The root of equation $x^3 - 2x + 0.5$ is 0.2586753

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

x	y
2	-8
2.1	-6.539
2.2	-4.952
2.3	-3.233
2.4	-1.376
2.5	0.625

$x_1 = 2.4 \qquad y_1 = -1.376$

$x_2 = 2.5 \qquad y_2 = 0.625$

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

$x_n = 2.46876562$

$y_n = -0.015826958$

$x_1 = 2.46876562 \qquad y_1 = -0.015826958$

$x_2 = 2.5 \qquad y_2 = 0.625$

$$x_n = \frac{2.46876562(0.625) - 2.5(-0.015826958)}{0.625 + 0.015826958}$$

$x_n = 2.46954$

$y_n = -0.00011$

∴ The root of the equation $x^3 + 2x - 20$ is 2.46954

4. $3x - \cos x - 1 = 0$

x	y
0	-1
0.1	-1.6699
0.2	-1.4
0.3	-1.1
0.4	-0.8
0.5	-0.5
0.6	-0.2
0.7	0.1
0.8	0.4
0.9	0.7
1.0	1

$x_1 = 0.6$ $\quad y_1 = -0.2$

$x_2 = 0.7$ $\quad y_2 = 0.1$

$$x_n = \frac{0.6(0.1) - 0.7(-0.2)}{0.1 + 0.2}$$

$$= 0.6667$$

$x_1 = 0.6667$ $\quad y_1 = -0.00006$

∴ The root of the equation $3x - \cos x - 1$ is $\frac{2}{3}$ or 0.6667

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

x	y
2	-3
2.1	-2.039
2.2	-0.952
2.3	0.267
2.4	1.624
2.5	3.125

$x_1 = 2.2$ $\quad y_1 = -0.952$

$x_2 = 2.3$ $\quad y_2 = 0.267$

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

$x_n = 2.2781$

$y_n = -0.0115542$

$x_1 = 2.2781$ $\quad y_1 = -0.0115542$

$x_2 = 2.3$ $\quad y_2 = 0.267$

$$x_n = \frac{2.2781(0.267) - 2.3(-0.0115542)}{0.267 + 0.0115542}$$

$x_n = 2.279$

$y_n = -0.0002$

∴ The root of the equation $x^3 - 3x - 5$ is 2.279

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

x	y
2	-0.59794
2.1	-0.52333
2.2	-0.44667
2.3	-0.36803
2.4	-0.28749
2.5	-0.20515
2.6	-0.12107
2.7	-0.03532
2.8	0.05204
2.9	0.14095
3.0	0.23136

$x_1 = 2.7 \quad y_1 = -0.03532$

$x_2 = 2.8 \quad y_2 = 0.05204$

$x_4 = \dfrac{2.7(0.05204) - 2.8(-0.03532)}{0.05204 + 0.03532}$

$x_4 = 2.74$

$y_4 = -0.000563$

∴ The root of the equation $x \log_{10} x - 1.2$ is 2.74

7. $x^3 - 4x + 1 = 0$

x	y
1	-2
1.1	-2.069
1.2	-2.072
1.3	-2.003
1.4	-1.856
1.5	-1.625
1.6	-1.304
1.7	-0.887
1.8	-0.368
1.9	0.259
2.0	1

$x_1 = 1.8 \quad y_1 = -0.368$

$x_2 = 1.9 \quad y_2 = 0.259$

$x_4 = \dfrac{1.8(0.259) - 1.9(-0.368)}{0.259 + 0.368}$

$x_4 = ~~1.4456~~ \; 1.85869$

$y_4 = -0.01349$

$x_1 = 1.85869 \quad y_1 = -0.01349$

$x_2 = 1.9 \quad y_2 = 0.259$

$x_4 = \dfrac{1.85869(0.259) - 1.9(-0.01349)}{0.259 + 0.01349}$

$x_4 = 1.8607$

$y_4 = -0.0006761$

∴ The root of the equation $x^3 - 4x + 1$ is 1.8607

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

x	y
1	-5
1.1	-4.249
1.2	-3.392
1.3	-2.423
1.4	-1.336
1.5	-0.125
1.6	1.216
1.7	2.693
1.8	4.312
1.9	6.079
2.0	8

$x_1 = 1.5 \quad y_1 = -0.125$

$x_2 = 1.6 \quad y_2 = 1.216$

$x_n = \frac{1.5(1.216) - 1.6(-0.125)}{1.216 + 0.125}$

$x_n = 1.509321402$

$y_n = 0.00558654$

$x_1 = 1.509321402 \quad y_1 = -0.00558654$

$x_2 = 1.6 \quad y_2 = 1.216$

$x_n = \frac{1.509321402(1.216) - 1.6(-0.00558654)}{1.216 + 0.00558654}$

$x_n = 1.509736$

$y_n = -0.00025$

∴ The root of the equation is $x^3 + 2x^2 - 8$ is 1.509736

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

x	y
0	1
0.1	0.101
0.2	-0.792
0.3	-1.673
0.4	-2.536
0.5	-3.375
0.6	-4.184
0.7	-4.957
0.8	-5.688
0.9	-6.371
1.0	-7

$x_1 = 0.1 \quad y_1 = 0.101$

$x_2 = 0.2 \quad y_2 = -0.792$

$x_n = \frac{0.1(-0.792) - 0.2(0.101)}{-0.792 - 0.101}$

$x_1 = 0.11131$

$y_n = 0.00041$

∴ The root of the equation $x^3 - 9x + 1$ is 0.11131

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

x	y
1	-4
1.1	-3.769
1.2	-3.472
1.3	-3.103
1.4	-2.656
1.5	-2.125
1.6	-1.504
1.7	-0.787
1.8	0.032
1.9	0.959
2.0	2

$x_1 = 1.7$ $\quad y_1 = -0.787$

$x_2 = 1.8$ $\quad y_2 = 0.032$

$$x_n = \frac{1.7(0.032) - 1.8(-0.787)}{0.032 + 0.787}$$

$$= 1.796$$

$y_n = 0.00279$

$x_1 = 1.796$ $\quad y_1 = -0.00279$

$x_2 = 1.8$ $\quad y_2 = 0.032$

$$x_n = \frac{1.796(0.032) - 1.8(-0.00279)}{0.032 + 0.00279}$$

$x_n = 1.79632$

$y_n = 0.00001$

∴ The root of the equation $x^3 - x - 4$ is 1.79632