

HW-2

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

$x \quad y = x^3 + x - 1$

0.5 -0.375

0.6 -0.184

0.7 0.043

0.8 0.312

0.9 0.629

1 1

By false position method:

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

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

$$= 0.681$$

$$y' = -0.00317876$$

$$x'' = \frac{(0.681)(0.043) - (-0.00318)(0.7)}{0.043 - (-0.00318)}$$

$$= 0.682308$$

$$y'' = -0.000047463$$

$$\therefore \text{root} = 0.682308$$

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

$x \quad y = x^3 - 2x + 0.5$

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 -0.5

$$x' = (0.2)(-0.073) - (0.3)(0.108)$$

$$= -0.073 - (0.108)$$

$$= 0.25967$$

$$y' = -0.0018848$$

0.2	0.108
0.2597	-0.001885

$$x'' = 0.25867$$

$$y'' = -0.000042942$$

$$\therefore \text{root} = 0.25867$$

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

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

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

$$x' = (2.4)(0.625) - (-1.376)(2.5)$$

$$= 0.625 - (-1.376)$$

$$= 2.46876$$

$$y' = -0.015827$$

$$x'' = (2.46876)(0.625) - (-0.015827)(2.5)$$

$$= 0.625 + 0.01583$$

$$= 2.4695$$

$$y'' = -0.00028311$$

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

x $y = 3x - \cos x - 1$

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

$x' = (0.6 \times 0.1) - (-0.199 \times 0.7)$

$0.06 + 0.1393$

$= 0.2063$

$y' = -0.0062682$

$x'' = (0.2063 \times 0.1) - (-0.006268 \times 0.7)$

$0.02063 + 0.0043876$

$= 0.0250176$

$y'' = -0.00015064$

Root $= 0.2063$

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

2 -3

2.1 -2.039

2.2 -0.952

2.3 0.267

$x' = (2.2)(0.267) - (2.3)(-0.952)$

$0.5874 + 2.1896$

$= 2.777$

$y' = -0.01159$

$x'' = (2.777)(0.267) - (2.3)(-0.01159)$

$0.74146 + 0.026657$

$= 0.768117$

$y'' = -0.0000968113$

$$\text{Root} = 2.2790$$

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

between 2 & 3

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	+0.0528
2.9	+0.1409
3	+0.2314

$$x' = 2.7404$$

$$y' = -0.0001839$$

$$x'' = 2.74061$$

$$y'' = -0.0000314505$$

$$\therefore \text{root} = 2.74061$$

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

x	$y = x^3 - 4x + 1$
0	1
1	-2
2	1

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

x y

0 -8

1 -5

2 8

1.5 -0.125

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

$$= 1.50769$$

$$y' = -0.02654$$

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

$$= 1.5093$$

$$y'' = -0.005862$$

$$x''' = 1.50966$$

$$y''' = -0.0012366$$

$$\text{Root} = 1.50966$$

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

x y

2 -9

3 1

2.5 -5.875

2.9 -0.711

2.9415 -0.02147

2.9427 -0.00153603

2.94731 +0.0763873

2.9428 -0.00049557

$$\text{Root} = 2.9428$$

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

$$10) \quad x^3 - x - 4 = 0$$

x	y
1	-4
2	2
1.5	-2.125
1.7	-0.787
1.8	0.032
1.79609	-0.001988
1.79632	-0.000027799

$$\text{Root} = 1.79632$$

Homework 1:-

1.	x	y
	7	3
	8	1
	9	1
	10	9
	9.5	?

$$\begin{aligned}
 f(9.5) &= \frac{(9.5-7)(9.5-8)(9.5-9)(9.5-10)}{(10-7)(10-8)(10-9)} + \\
 &\quad \frac{(9.5-7)(9.5-8)(9.5-10)(1)}{(9-7)(9-8)(9-10)} + \\
 &\quad \frac{(9.5-7)(9.5-9)(9.5-10)(1)}{(8-7)(8-9)(8-10)} + \\
 &\quad \frac{(9.5-8)(9.5-9)(9.5-10)(3)}{(7-8)(7-9)(7-10)} \\
 &= 3.625
 \end{aligned}$$

2.	x	y = f(x)
	3	168
	7	120
	9	72
	10	63

$$\begin{aligned}
 f(6) &= \frac{(6-3)(6-7)(6-9)(63)}{(10-3)(10-7)(10-9)} + \frac{(6-7)(6-9)(6-10)(168)}{(3-7)(3-9)(3-10)} \\
 &\quad + \frac{(6-3)(6-7)(6-10)(72)}{(9-3)(9-7)(9-10)} + \frac{(6-3)(6-9)(6-10)(120)}{(7-3)(7-9)(7-10)} \\
 &= 147
 \end{aligned}$$

3)

x	$y = f(x)$
1	4
2	5
7	5
8	4

$$f(6) = \frac{(6-1)(6-2)(6-7)(4)}{(8-1)(8-2)(8-7)} + \frac{(6-1)(6-2)(6-8)(5)}{(7-1)(7-2)(7-8)} \\ + \frac{(6-1)(6-7)(6-8)(5)}{(2-1)(2-7)(2-8)} + \frac{(6-2)(6-7)(6-8)(4)}{(8-2)(1-7)(1-8)} \\ = 5.666$$

4)

x	$y = f(x)$
1	2
2	4
3	8
4	16
7	128

$$f(5) = \frac{(5-1)(5-2)(5-3)(5-4)(128)}{(7-1)(7-2)(7-3)(7-4)} + \frac{(5-1)(5-2)(5-3)}{(4-1)(4-2)(4-3)} \\ \frac{(5-7)(16)}{(4-7)} + \frac{(5-1)(5-2)(5-4)(5-7)(8)}{(3-1)(3-2)(3-4)(3-7)} + \\ \frac{(5-1)(5-3)(5-4)(5-7)(4)}{(2-1)(2-3)(2-4)(2-7)} + \frac{(5-2)(5-3)(5-4)(5-7)2}{(1-2)(1-3)(1-4)(1-7)} \\ = 32.934$$

5)

x	$y = f(x)$
10	0.25
20	0.2
14	0.15
16	0.10

$$f(15) = \frac{(-5)(1)(-1)(0.25)}{(-10)(-4)(-6)} + \frac{(5)(1)(-1)(0.2)}{(10)(-6)(-4)} + \frac{(5)(-5)(-1)(0.15)}{(4)(-6)(-2)} \\ + \frac{(4)(3)(2)(0.1)}{(6)(2)(-4)} = 32.9340.10521$$