CALCULUS ~~ASSIGNMENT~~

HOMEWORK 1

Q.1)

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

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

$$f(9.5) = 0.1875 - 0.3125 + 0.0375 + 2.8125 = 3.625.$$

$$f(9.5) = 3.625.$$

Q.2)

x	3	7	9	10
f(x) = obs	168	120	72	63

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

$$f(6) = 12 + 180 - 72 + 27 = 147.$$

$$f(6) = 147.$$

∴ Obs at pos^{m} 6 is 147.

Q.3)

x	1	2	7	8
f(x)	4	5	5	4

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

$$f(6) = -0.761905 + 1.66667 + 6.66667 - 1.90476 = 5.6667.$$

(04)

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

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

$$f(5) = \frac{-2}{3} + \frac{32}{5} - 24 + \frac{8 \times 16}{3} + \frac{128}{15} = 32.933$$

$\therefore f(5) = 32.933$.

(05)

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

$$f(15) = \frac{(15-20)(15-14)(15-16)}{(10-20)(10-14)(10-16)} * f(10) + \frac{(15-10)(15-14)(15-16)}{(20-10)(20-14)(20-16)} * f(20)$$
$$+ \frac{(15-10)(15-20)(15-16)}{(14-10)(14-20)(14-16)} * f(14) + \frac{(15-10)(15-20)(15-14)}{(16-10)(16-20)(16-14)} * f(16)$$

$$= \frac{-1}{142} - \frac{1}{240} + \frac{5}{64} - \frac{1}{96} = 0.0583$$

$\therefore f(15) = 0.0583$.

HOMEWORK-2 REGULA FALSI METHOD.

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

x	f(x)
0.5	-0.375
0.6	-0.184
0.7	0.043

$\therefore x_1 = \frac{(0.6 \times 0.043) - (0.7 \times (-0.184))}{0.043 - (-0.184)} = 0.681057$; $y_1 = -0.0030418$.

NEW TABLE →

x	y
0.681057	-0.0030418
0.7	0.043

$x_2 = \frac{(0.681057 \times 0.043) - (0.7 \times (-0.0030418))}{0.043 - (-0.0030418)}$

$x_2 = 0.682308$

$y_2 = -0.00004629$.

$x = 0.682908$ is a root of $x^3+x-1=0$

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

$x_1 = \frac{(0.5 \times 0.5) - (0 \times (-0.375))}{0.5 - (-0.375)} = \frac{2}{7}$

x	y
1	-0.5
0.5	-0.375
0	0.5

$x_1 = 0.285714$.

$y_1 = -0.048105$.

NEW TABLE

x	y
0.285714	-0.048105
0	0.5

$x_2 = \frac{0.285714 \times 0.5 - (0 \times (-0.048105))}{0.5 - (-0.048105)}$

$x_2 = 0.260638$; $y_2 = -0.0035703$

NEW TABLE

x	y
0.260638	-0.0035703
0	0.5

$x_3 = \frac{(0.260638 \times 0.5) - 0}{0.5 + 0.0035703}$

$x_3 = 0.258793$, $y_3 = 0.000248398$.

$x = 0.25879$ is a root of $x^3-2x+0.5=0$.

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

x	y
2.4	-1.376
2.5	0.625

$$x_1 = \frac{[2.4 * 0.625) - (2.5 * (-1.376))}{0.625 - (-1.376)}$$

$x_1 = 2.468766$

$y_1 = -0.015827$

NEW TABLE →

x	y
2.468766	-0.015827
2.5	0.625

$$x_2 = \frac{2.468766 * 0.625 + 2.5 * 0.015827}{0.625 + 0.015827}$$

$x_2 = 2.46954$

$y_2 = -0.000009 59747$

$x = 2.46954$ is a root of $x^3 + 2x - 20 = 0$

0.4) $3x - \cos x - 1 = 0$

x	y
0	-2
0.5	-0.499962
1	1.00015

$$x_1 = \frac{0.5 * 1.00015 + 1 * 0.499962}{1.00015 + 0.499962}$$

$x_1 = 0.666642$, $y_1 = -0.000005 3408$.

$x = 0.666642$ is a root of $3x - \cos x - 1 = 0$

0.5) $x^3 - 3x - 5 = 0$

x	y
2	-3
2.2	-0.952
2.3	0.267

$$x_1 = \frac{2.2 * 0.267 + 2.3 * 0.952}{0.267 - (-0.952)} = 2.278096$$

$y_1 = -0.0115944$

x	y
2.278096	-0.0115944
2.3	0.267

$x_2 = 2.279008$

$y_2 = -0.0001408$

$x = 2.279008$ is a root of $x^3 - 3x - 5 = 0$.

0.6) $x \cdot \log_{10} x - 1.2 = 0$

x	y
2	-0.59794
2.5	-0.2051499
2.6	-0.12106929
2.8	0.05204248

$x_1 = \frac{2.6 * 0.05204248 - 2.8 * (-0.12106929)}{0.05204248 - (-0.12106929)}$

$x_1 = 2.739874$

$y_1 = -0.00067322$

$x = 2.739874$ is a root $x\log_{10} x - 1.2 = 0$

0.7) $x^3 - 4x + 1 = 0$

x	y
0	1
0.2	0.208
0.4	-0.536

~~$x_1 = 0.2 * (-0.536)$~~

$x_1 = \frac{0.4 * (0.208) - 0.2(-0.536)}{0.208 - (-0.536)}$

$x_1 = 0.255914$; $y_1 = -0.0068956$

x	y
0.255914	-0.0068956
0.2	0.208

$x_2 = \frac{0.208 * 0.255914 - (-0.0068956) * 0.2}{0.208 - (-0.0068956)}$

$x_2 = 0.254119$; $y_2 = -0.00006902 8$

$x = 0.254119$ is a root of $x^3 - 4x + 1 = 0$

0.8) $x^3 + 2x^2 - 8 = 0$

x	y
0	-8
1	-5
2	8
1.5	-0.125
1.6	1.216

$x_1 = \frac{(1.5 * 1.216) - (1.6 * -0.125)}{1.216 - (-0.125)} = 1.5093214$.

$y_1 = -0.00558654$.

x	y
1.5093214	-0.00558654
1.6	1.216

$x_2 = 1.509736$

$y_2 = -0.00024786 \approx 0$

$x = 1.509736$ is a root of $x^3 + 2x^2 - 8 = 0$

0.9) $x^3 - 9x + 1 = 0$

x	y
0	1
0.1	0.101
0.2	-0.792

$$x_1 = \frac{(0.2 * 0.101) - (0.1 * (-0.792))}{0.101 - (-0.792)}$$

$x_1 = 0.11131$

$y_1 = 0.0004125 \approx 0$

$x = 0.11131$ is root of $x^3 - 9x + 1 = 0$

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

x	y
2	2
1.5	-2.125
1.7	-0.787
1.8	0.032

$$\therefore x_1 = \frac{(1.7 * 0.032) - (-0.787 * 1.8)}{0.032 - (-0.787)}$$

$\therefore x_1 = 1.7960927$

$\therefore y_1 = -0.0019884$

x	y
1.7960927	-0.0019884
1.8	0.032

$x_2 = 1.7963212$

$y_2 = -0.0000535$

$x = 1.7963212$ is a root of $x^3 - x - 4 = 0$