

## Homework - 1

1)

Q1)

|        |   |   |   |    |
|--------|---|---|---|----|
| $x$    | 7 | 8 | 9 | 10 |
| $f(x)$ | 3 | 1 | 1 | 9  |

Find  $f(9.5)$ ?

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

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

$$= \frac{3}{16} - \frac{5}{16} + \frac{5}{16} + \frac{45}{16}$$

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

Q2)

|        |     |     |    |    |
|--------|-----|-----|----|----|
| $x$    | 3   | 7   | 9  | 10 |
| $f(x)$ | 108 | 120 | 72 | 63 |

Find  $f(6)$ ?

$$f(6) = \frac{(6-7)(6-9)(6-10)(108)}{(3-7)(3-9)(3-10)} + \frac{(6-3)(6-9)(6-10)(120)}{(7-3)(7-9)(7-10)}$$

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

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

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

003)

|        |   |   |   |   |
|--------|---|---|---|---|
| $x$    | 1 | 2 | 7 | 8 |
| $f(x)$ | 4 | 5 | 5 | 4 |

$f(6) = ?$

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

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

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

$$= \underline{\underline{5.6667}}$$

004)

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

$f(5) = ?$

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

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

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

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

$$= \underline{\underline{32.9334}}$$

Q5)

|        |      |      |      |      |
|--------|------|------|------|------|
| $x$    | 10   | 20   | 14   | 16   |
| $f(x)$ | 0.25 | 0.20 | 0.15 | 0.10 |

$f(15) = ?$

$$f(15) = \frac{(15-20)(15-14)(15-16)(0.25)}{(10-20)(10-14)(10-16)} + \frac{(15-10)(15-14)(15-16)(0.20)}{(20-10)(20-14)(20-16)}$$

$$+ \frac{(15-10)(15-20)(15-16)(0.15)}{(24-10)(24-20)(24-16)} + \frac{(15-10)(15-20)(15-14)(0.10)}{(16-10)(16-20)(16-14)}$$

$$= \frac{1}{112} - \frac{1}{240} + \frac{5}{64} + \frac{5}{96}$$

$$= \underline{\underline{0.1208}}$$



2]

Q1)  $x^3 + x - 1 = 0$  b/w 0.5 and 1

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

| x   | y      |
|-----|--------|
| 0.5 | -0.315 |
| 0.6 | -0.184 |
| 0.7 | 0.043  |

$$x_n = \frac{x_1 y_2 - x_2 y_1}{y_2 - y_1}$$

$x_1 = 0.6$

$x_2 = 0.7$

$y_1 = -0.184$

$y_2 = 0.043$

$$x_n = \frac{(0.043)(0.6) + (0.7)(0.184)}{0.043 + 0.184} = 0.6810$$

$n = -0.003042$

$x_1 = 0.6810$

$x_2 = 0.7$

$y_1 = -0.003042$

$y_2 = 0.043$

$$x_n = \frac{(0.043)(0.6810) + (0.7)(0.003042)}{0.043 + 0.003042}$$

$= 0.6823$

$y_n = -0.000045$

$\therefore$  Root  $y' x^3 + x - 1 = 0$  is  $= 0.6823$

Q2)  $x^3 + 2x + 0.5 = 0$  b/w 0 and 1  
 $\therefore y = x^3 + 2x + 0.5$

| $x$ | $y$    |
|-----|--------|
| 0   | 0.5    |
| 0.1 | 0.301  |
| 0.2 | 0.108  |
| 0.3 | -0.073 |

$$x_1 = 0.2 \quad x_2 = 0.3$$

$$y_1 = 0.108 \quad y_2 = -0.073$$

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

$$= 0.259669$$

$$y_n = -0.001829$$

$$x_1 = 0.2$$

$$x_2 = 0.259669$$

$$y_1 = 0.108$$

$$y_2 = -0.001829$$

$$x_n = \frac{(-0.001829) - (0.259669)(0.108)}{-0.001829 - 0.108}$$

$$= 0.255675$$

$$y_n = -0.000041$$

$$\therefore \text{Root of } "x^3 + 2x + 0.5" \text{ is } = 0.258675$$

Q3)  $x^3 + 2x - 20 = 0$

b/w 2 and 2.5

$$\therefore y = x^3 + 2x - 10$$

| $x$ | $y$     |
|-----|---------|
| 2.0 | -2      |
| 2.1 | -6.539  |
| 2.2 | -4.953  |
| 2.3 | -3.233  |
| 2.4 | -0.1625 |
| 2.5 | 0.625   |

$$x_1 = 2.4$$

$$x_2 = 2.5$$

$$y_1 = -0.1371$$

$$y_2 = 0.625$$

$$x_n = \frac{(0.625)(2.4) + (-0.1371)(2.5)}{0.625 + 0.1371}$$

$$= 2.46878$$

$$y_n = -0.01582$$

$$x_1 = 2.426878$$

$$x_2 = 2.5$$

$$y_1 = -0.01582$$

$$y_2 = 0.625$$

$$x_n = \frac{(0.625)(2.426878) + (-0.01582)(2.5)}{0.625 + 0.01582}$$

$$x_n = \frac{(0.625)(2.46176) + (-0.01582)(2.5)}{0.625 + 0.01582}$$

$$= 2.46954$$

$$y_n = -0.000176$$

$\therefore$  Root of " $x^3 + 2x - 20$ " is 2.46954



Q4)

$$3x - 105x - 1 = 0$$

b/w 0 and 1

$$\therefore y = 3x - 105x - 1$$

| x   | y        |
|-----|----------|
| 0   | -2       |
| 0.1 | -1.69998 |
| 0.2 | -1.39994 |
| 0.3 | -1.09998 |
| 0.4 | -0.79994 |
| 0.5 | -0.49999 |
| 0.6 | -0.1999  |
| 0.7 | 0.10007  |

$$x_1 = 0.6$$

$$x_2 = 0.7$$

$$y_1 = -0.1999$$

$$y_2 = 0.10007$$

$$x_n = \frac{(0.10007)(0.6) + (0.7)(-0.1999)}{0.10007 + (-0.1999)} = 0.6666$$

$$y_n = -0.0000003$$

$\therefore$  Root of ' $3x - 105x - 1$ ' is  $-0.6666$

Q5)

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

b/w 0 and 2.5

$$\therefore y = x^3 - 3x - 5$$

| x   | y      |
|-----|--------|
| 2.0 | -3     |
| 2.1 | -2.039 |
| 2.2 | -0.952 |
| 2.3 | 0.267  |
| 2.4 | 1.629  |

$$x_1 = 2.2$$

$$y_1 = -0.952$$

$$x_2 = 2.3$$

$$y_2 = 0.267$$

$$x_n = \frac{(0.267)(0.2) + (-0.952)(2.3)}{0.267 + (-0.952)}$$

$$= 2.27809$$

$$y_n = -0.01159$$

$$x_1 = 2.27809$$

$$x_2 = 2.3$$

$$y_1 = -0.01159$$

$$y_2 = 0.267$$

$$x'_n = \frac{(0.267)(2.27809) + (2.3)(-0.01159)}{0.267 + (-0.01159)}$$

$$= 2.27901$$

$$y'_n = 0.0001$$

∴ Root of

$$x^3 - 3x = 5$$

$$= 0$$

is

$$2.27901$$

Q6)

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

6/wood 2 and 3

$$\therefore y = x \log_{10} x - 1.2$$

| $x$ | $y$      |
|-----|----------|
| 2.0 | -0.59794 |
| 2.1 | -0.52339 |
| 2.2 | -0.44667 |
| 2.3 | -0.36806 |
| 2.4 | -0.28749 |
| 2.5 | -0.20514 |
| 2.6 | -0.12106 |
| 2.7 | -0.0353  |
| 2.8 | 0.052005 |



$$x_1 = 2.7$$

$$x_2 = 2.8$$

$$y_1 = 0.0353$$

$$y_2 = 0.05205$$

$$x_n = \frac{(0.05205)(2.7) + (2.8)(0.0353)}{(0.05205) + (0.0353)} = 2.7404$$

$$y_n = -0.00019$$

$\therefore$  Root of  $x \log_{10} x - 12$  is 2.7407

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

$$\therefore y = x^3 - 4x + 1$$

| x   | y      |
|-----|--------|
| 0   | 1      |
| 0.1 | 0.60   |
| 0.2 | 0.208  |
| 0.3 | -0.173 |

$$x_1 = 0.2$$

$$x_2 = 0.3$$

$$y_1 = 0.208$$

$$y_2 = -0.173$$

$$x_n = \frac{(-0.173)(0.2) - (0.3)(0.208)}{-0.173 - 0.208} = 0.2546$$

$$y_n = -0.00187$$

$$x_1 = 0.2$$

$$x_2 = 0.2546$$

$$y_1 = 0.208$$

$$y_2 = -0.00187$$

$$x'_n = \frac{(-0.00187)(0.2) - (0.208)(0.2546)}{-0.00187 - 0.208} = 0.2541$$

$$y''_n = -0.00002$$

$\therefore$  Root of ' $x^3 - 4x + 1 = 0$ ' is 0.254

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

$y = x^3 + 2x^2 - 8$

| $x$ | $y$ |
|-----|-----|
| 0   | -8  |
| 1   | -5  |
| 2   | 8   |

$x_1 = 1$

$x_2 = 2$

$y_1 = -5$

$y_2 = 8$

$x_n = \frac{(8)(1) + (5)(2)}{8 + 5} = 1.3846$

$y_n = -1.5112$

$x_1 = 1.3846$

$x_2 = 2$

$y_1 = -1.5112$

$y_2 = 8$

$x'_n = \frac{(8)(1.3846) + (2)(1.5112)}{8 + 1.5112} = 1.4824$

$y'_n = -0.3475$

$x_1 = 1.4824$

$x_2 = 2$

$y_1 = -0.3475$

$y_2 = 8$

$x''_n = \frac{(8)(1.4824) + (0.3475)(2)}{8 + 0.3475} = 1.5039$

$y''_n = 0.0747$

$x_1 = 1.5033$

$x_2 = 2$

$y_1 = -0.0747$

$y_2 = 8$

$$x_n''' = \frac{(8)(1.5033) + (0.0747)(2)}{8 + 0.747} = 1.5085$$

$$y_n''' = -0.0158$$

$$x_1 = 1.5085$$

$$x_2 = 2$$

$$y_1 = 0.1158$$

$$y_2 = 5$$

$$x_n''' = \frac{(8)(1.5085) + (0.958)(2)}{8 + 0.0158} = 1.5095$$

$$y_n''' = -0.0033$$

$$x_1 = 1.8095$$

$$x_2 = 2$$

$$y_1 = -0.0033$$

$$y_2 = 8$$

$$x_n = \frac{(8)(1.8095) + (0.0033)(2)}{8 + 0.0033} = 1.5097$$

$$y_n = -0.0007$$

$\therefore$  Root of ' $x^3 + 20x^2 - 8$ ' is 1.5097

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

$$\therefore y = x^3 - 9x + 1$$

| x   | y     |
|-----|-------|
| 0   | 1     |
| 0.1 | 0.101 |
| 0.2 | 0.792 |

$$x_1 = 0.1$$

$$x_2 = 0.2$$

$$y_1 = 0.101$$

$$y_2 = -0.792$$



$$x_n = \frac{(-0.192)(0.1) - (0.2)(0.101)}{-0.192 - 0.101} = 0.1113$$

$$y_n = 0.00041$$

$\therefore$  Root of  $x^3 - 9x + 1$  is  $0.1113$

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

$$\therefore y = x^3 - x - 4$$

| $x$ | $y$ |
|-----|-----|
| 0   | -4  |
| 1   | -4  |
| 2   | 2   |

$$x_1 = 1$$

$$x_2 = 2$$

$$y_1 = -4$$

$$y_2 = 2$$

$$x_n = \frac{(2)(1) + 4(2)}{2 + 4} = 1.3334$$

$$y_n = -2.9629$$

$$x_1 = 1.3334$$

$$x_2 = 2$$

$$y_1 = -2.9629$$

$$y_2 = 2$$

$$x_n = \frac{(2)(1.3334) + (2)(2.9629)}{2 + 2.9629} = 1.7313$$

$$y_n = -0.5415$$

$$x_1 = 1.7313$$

$$x_2 = 2$$

$$y_1 = -0.5415$$

$$y_2 = 2$$

$$x_n = \frac{(2)(1.7313) + (2)(0.5415)}{2 + 0.5415} = 1.2885$$

$$y_n = 0.6680$$

$$x_1 = 1.7885 \quad x_2 = 2$$

$$y_1 = 0.6680 \quad y_2 = 2$$

$$x_n = \frac{(2)(1.7885) + (2)(0.6680)}{2 + 0.6680} = 1.7954$$

$$y_n = -0.0078$$

$$x_1 = 1.7954 \quad x_2 = 2$$

$$y_1 = 0.0078 \quad y_2 = 2$$

$$x_n = \frac{(2)(1.7954) + (2)(0.0078)}{(2) + 0.0078} = 1.7912$$

$$\therefore y_n = 0.00091$$

$\therefore$  Root of ' $x^3 - 3 - 4$ ' is 1.7962