ASSIGNMENT- 01

- 18K41A0536
CSE- A

Find global minimum point and value for function $f(x) = x^4 + 3x^2 + 10$

→ manual calculations for two iterations

given $f(x) = x^4 + 3x^2 + 10$

step 1: Initialise variables

$x = 1$

$\eta = 0.1$

epoches = 2

step 2: first order derivative of $f(x)$ at $x = 1$

$$\left(\frac{df}{dx}\right)_{x=1} = (4x^3 + 6x)_1 = 4(1) + 6(1) = 10$$

step 3: calculate change in x

$$\Delta x = -\eta \frac{df}{dx}$$

$$= -(0.1)(10)$$

$$\Delta x = -1$$

step 4 : update variable x

$$x = x + \Delta x$$

$$= 1 + (-1)$$

$$\boxed{x = 0}$$

step 5 : Increment Iterations

$$itr = itr + 1$$

step 6 : if (iterations > epoches)

Then go to step 7

else go to step 2

here $itr = 2$, epochs $= 2$

$2 > 2 \rightarrow$ false

hence goto step 2

step 2 : calculate first order derivative of $f(x)$ at $x = 0$

$$\left(\frac{\partial f}{\partial x}\right)_{x=0} = (4x^3 + 6x)_0 = 0$$

step 3 : calulate change in x

$$\Delta x = -\eta \frac{\partial f}{\partial x}$$

$$= -(0.1)\,0 = 0$$

step 4: update variable x

$x = x + \Delta x$

$= 0 + 0$

$= 0$

step 5: Increment Iterations

$itr = itr + 1$

step 6: if ($itr >$ epoches) go to step 7

else go to step 2

here, $itr = 3$, epoches = 2

$3 > 2$, True

hence go to step 7

step 7: print variable $x \Rightarrow x = 0$

at $x = 0$ we find minimum value of function $f(x)$

That minimum value $= f(0) = 10$