Assignment-1

—18K41A0599

Find global minimum point and value for function

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

→ manual calculations for Two iterations.

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

step1 : Initialise variables.

$$x = 1$$

$$\eta = 0.1$$

$$epoches = 2$$

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

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

step 3 : calculate change in x

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

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

$$\Delta x = -1$$

step 4 : update variable x

$$x = x + \Delta x$$

$$= 1 + (-1)$$

$$x = 0$$

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 , epoches = 2

$2 > 2 \rightarrow$ false

hence, go to step 2.

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

at $x = 0$.

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

step 3 : calculate change in x

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

$$= -(0.1)0$$

$$= 0$$

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 = 3

$3 > 2$, True

hence goto step 7

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

at $x = 0$ we find minimum value of function $f(x)$, that minimum value $= f(0) = 10$.