

Q:- Find the global minimum point & value for the function.

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

step 1:-

$$\eta = 0.001$$

$$x = 10 \quad \text{iter} = 0$$

$$\text{iteration} = 2$$

step 2:-

calculation of slope

$$\frac{\partial f(x)}{\partial x} = 4x^3 + 6x$$

$$\begin{aligned} \frac{\partial f(x)}{\partial x} \quad \text{sub } x=10 \\ = 4(10)^3 + 6(10) \\ = 4 \times 1000 + 60 \end{aligned}$$

step 3:-

$$\begin{aligned} \Delta x &= 1 - \eta_1 \cdot \frac{\partial f(x)}{\partial x} \\ &= 4.06 \end{aligned}$$

change in variable value

$$\Delta x = - (0.001)(4060)$$

step 4:-

$$= -4.060$$

$$x = x + \Delta x = 10 - 4.060$$

$$x = 5.94$$



step 5:-  $iters = 0 + 1 = 1$

step 6:- if ( $iters \geq iterations$ )  
 $1 \geq 2$ .

$x = 5.94$  goto step 2.

step 2:-  $\partial f(x) / \partial x$

$$= 4 \times (5.94)^3 + 6(5.94)$$

$$= 838.33 + 35.64$$

$$= 873.97.$$

step 3:-

$$\Delta x = -(0.001) \times 873.97.$$

$$= -0.873$$

step 4:-

$$x = 5.94 - 0.873$$

$$= 5.067.$$



step 5:-  $iters = 1+1 = 2$ .

step 6:-  $iters > iterations$

$2 > 2$ .

True.

$$= (5.067)^4 + 3 \times (5.067)^2 + 10$$

$$= 659.17 + 33.667 + 10$$

$$= 702.837$$

Min value of  $f(x) = 702.837$  at  $x = 5$