

Assignment - 1

18K41A05F9

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

Solution :-

$$\text{Given } f(x) = x^4 + 3x^2 + 10$$

first initialize $x = 10$

learning rate, $n = 0.001$

no. of iterations = 2

iter = 0

calculate slope

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

substitute $x = 10$

$$\frac{\partial f(x)}{\partial x} = 4(1000) + 6(10)$$

$$= 4060$$

$$x = x - n \cdot \frac{\partial f(x)}{\partial x}$$

$$= 10 - 0.001(4060)$$

$$= 10 - 4.06$$

$$= 5.94$$

$$iter = iter + 1$$

$$iter = 0 + 1 = 1$$

$$\text{Now } x = 5.94$$

$$x = x - n \cdot \frac{f'(x)}{f''(x)}$$

$$= 5.94 - 0.001 \left(4(5.94)^3 + 6(5.94) \right)$$

$$= 5.94 - 0.874$$

$$= 5.066 \approx 5.06$$

$$iter = iter + 1$$

$$iter = 1 + 1 = 2$$

$iter < \text{max_iterations} \rightarrow \text{False}$
stop here.

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

$$f(5.06) = (5.06)^4 + 3(5.06)^2 + 10$$
$$= 742.35$$

Minimum value of $f(x) = 742.35$

at $x = 5.06$

for 2 iterations.