

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

Iteration 1 :-

① Choose initial value for x and η

$$x = 1, \eta = 0.1$$

② Gradient calculation

$$\begin{aligned} \frac{\partial f(x)}{\partial x} &= 4x^3 + 6x + 0 \\ &= 4(1)^3 + 6(1) = 10 \end{aligned}$$

③ Step length

$$\Delta x = -\eta \left(\frac{\partial f(x)}{\partial x} \right) = -(0.1)(10) = -1$$

④ Update x value

$$x = x + \Delta x = 1 - 1 = 0$$

Iteration 2 :-

① Gradient calculation for $x = 0$

$$\frac{\partial f(x)}{\partial x} = 4(-3.4)^3 + 6(-3.4) = -177.61$$

② Step length

$$\Delta x = -\eta \left(\frac{\partial f(x)}{\partial x} \right) = -(0.1)(-177.61) = 17.761$$

③ update x value

$$x = x + \Delta x = 0 + 17.761 = 17.761$$

→ This procedure repeats until gradient is near to Zero.