

18K41A05A5

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

Do manual calculations for 2 iterations.

Step 1: $x = \phi$, epochs = 2

learning rate $\eta = 0.01$.

Step 2: $\frac{\partial f}{\partial x} = 4x^3 + 6x = 4(\phi) + 6(\phi) = 10$ $[\because x = \phi]$

Step 3: $\Delta x = -\eta \cdot \frac{\partial f}{\partial x} = -(0.01)(10)$

$$= -0.1$$

Step 4: $x = x + \Delta x$
 $= \phi + (-0.1)$
 $= -0.1$
 $\boxed{x = -0.1}$

Step 5: iter = 1 + 1 = 2

Step 6: iter > epoch

$$1 + (2 > 2) \rightarrow \text{false}$$

go to step 2

$$\begin{aligned}\frac{\partial f}{\partial x} &= 12x^2 + 6 \\ &= 12(0.9)^2 + 6 \\ &= 9.72 + 6 \\ &= 15.72\end{aligned}$$

Step 3:

$$\Delta x = -n \cdot \frac{\partial f}{\partial x} = -0.01 \cdot (15.72) = -0.1572$$

Step 4:

$$x = x + \Delta x$$

$$\begin{aligned}&= 0.9 - 0.1572 \\ x &= 0.7428\end{aligned}$$

Step 5: iter = 2 + 1 = 3

Step 6: here $(3 > 2) \rightarrow \text{true}$

So, $x = 0.7428$

$$\begin{aligned}f(x) &= x^4 + 3x^2 + 10 \\ &= (0.7428)^4 + 3(0.7428)^2 + 10 \\ &= 0.3044 + 3(0.5517) + 10 \\ &= 0.3044 + 1.6552 + 10 \\ f(0.7428) &= 11.9596\end{aligned}$$