

Assignment-2

12KLA0491

find the global minimum point and value for the function $f(x, y) = x^2 + y^2 + 10$

- Do manual calculations for two iterations
- find the optimal solution using python programming

step 1 :- $x = -1$ $y = +1$ $\eta = 0.1$ epochs = 2

step 2 :- $itr = 1$

step 3 :- $\frac{\partial f}{\partial x} = 2x = -2$

$$\frac{\partial f}{\partial y} = 2y = 2$$

step 4 :- $dx = -\eta \frac{df}{dx} = -2(-0.1)$
 $= 0.2$

$$\Delta y = -\eta \frac{df}{dy} = -(0.1)(2)$$

 $= -0.2$

step 5 :- $x = x + \Delta x = -1 + 0.2 = -0.8$

$$y = y + \Delta y = 1 - 0.2 = 0.8$$

step 6 :- $itr = itr + 1 = 1 + 1 = 2$

step 7 :- if ($itr > epochs$)
goto step-5

else

goto step-3

step 3 :- $\frac{df}{dx} = 2x = 2(-0.8) = -1.6$

$$\frac{\partial f}{\partial y} = 2y = 2(0.8) = 1.6$$

$$\text{step-4: } \Delta x = -\eta \frac{\partial f}{\partial x}$$

$$= -(0.1)(-1.6) = 0.16$$

$$\Delta y = -\eta \frac{\partial f}{\partial y}$$

$$= -(0.1)(1.6)$$

$$= -0.16$$

$$\text{step-5: } x = x + \Delta x = -0.8 + 0.16 \\ = -0.64$$

$$y = y + \Delta y \\ = 0.8 - 0.16 = 0.64$$

$$\text{step-6: } \text{itr} = \text{itr} + 1 = 2 + 1 = 3$$

$$\text{step-7: } \text{if } (\text{itr} > \text{epochs})$$

$$3 > 2$$

$$\text{goto step-8}$$

else

$$\text{goto step-3}$$

$$\text{step 8: } x = -0.64$$

$$y = 0.64$$

$$f(x, y) = x^2 + y^2 + 10$$

$$= (-0.64)^2 + (0.64)^2 + 10$$

$$= 0.4 + 0.4 + 10$$

$$= 10.8$$