

Assignment - 2

18K41A0551

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

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

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

$$\text{Step 4 : } \Delta x = -\eta \frac{df}{dx} = -2(-0.1) \\ = 0.2$$

$$\Delta y = -\eta \frac{df}{dy} = -(0.1)(2) \\ = -0.2$$

$$\text{Step 5 : } x = x + \Delta x = -1 + 0.2 = -0.8$$

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

$$\text{Step 6 : } \text{itr} = \text{itr} + 1 \\ = 1 + 1 \\ = 2$$

Step 7: if (itr > epochs)

go to step 5

else

go to step 3

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

$$\frac{df}{dy} = 2y = 2(0.8) = 1.6$$

$$\text{Step 4: } \Delta x = -\eta \frac{df}{dx} = -(0.1)(-1.6) = 0.16$$

$$\Delta y = -\eta \frac{df}{dy} = -(0.1)(1.6) = -0.16$$

$$\text{Step 5: } x = x + \Delta x$$

$$= -0.8 + 0.16$$

$$= -0.64$$

$$y = y + \Delta y$$

$$= 0.8 + (-0.16)$$

$$= 0.64$$

$$\text{Step 6: } \text{itr} = \text{itr} + 1$$

$$= 2 + 1 = 3$$

Step 7: if (itr > epochs)

$$3 > 2$$

goto step-8

else

goto step 3

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

$$y = 0.64$$

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

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

$$= 0.4 + 0.4 + 10$$

$$= 10.8$$