

Assignment - 2

18K41A0538

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: $x = -1$ $y = +1$ $\eta = 0.1$ $\text{epochs} = 2$

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

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

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

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

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

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

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

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

$$= 1 + 1 = 2$$

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

goto step-5

else

goto step-3

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

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

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

$$\Delta y = -\eta \frac{\partial f}{\partial y} \\ = -(0.1)(1.6) \\ = -0.16$$

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

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

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

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

$$3 > 2$$

goto step-8

else

goto step-3

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

$$y = 0.64$$

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

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

$$= 0.4 + 0.4 + 10$$

$$= 10.8$$