

ASSIGNMENT-2

18K41A0575

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

Sol: $f(x, y)$ has global minimum at $x=0, y=0$

$$f(0, 0) = (0)^2 + (0)^2 + 10$$

$$= 10$$

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

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

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

Initialize $x = 1$ and $y = -1$

$\eta = 0.01$, epochs = 2

Iteration 1:

$$\frac{\partial f}{\partial x} = 2x = 2(1) = 2$$

$$\frac{\partial f}{\partial y} = 2y = 2(-1) = -2$$

$$\Delta x = -\eta \cdot \frac{\partial f}{\partial x} = -0.01(2) = -0.02$$

$$\Delta y = -\eta \cdot \frac{\partial f}{\partial y} = -0.01(-2) = 0.02$$

$$\text{New } x \text{ value} = x + \Delta x = 1 - 0.02 = 0.98$$

$$\text{New } y \text{ value} = y + \Delta y = -1 + 0.02 = -0.98$$

Iteration 2:

$$x = 0.08, y = -0.08$$

$$\frac{\partial f}{\partial x} = -2x = -2(0.08) = -0.16$$

$$\frac{\partial f}{\partial y} = -2y = -2(-0.08) = 0.16$$

$$\Delta x = -\eta \cdot \frac{\partial f}{\partial x} = -(0.01)(-0.16) = 0.0016$$

$$\Delta y = -\eta \cdot \frac{\partial f}{\partial y} = -(0.01)(0.16) = -0.0016$$

$$\begin{aligned} \text{New-}x \text{ value} &= x + \Delta x = 0.08 + 0.0016 \\ &= 0.0816 \end{aligned}$$

$$\begin{aligned} \text{New-}y \text{ value} &= y + \Delta y = -0.08 - 0.0016 \\ &= -0.0816 \end{aligned}$$