Find the global minimum point & 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.

sol:-

step1:- $x = -1, y = 1, \eta = 0.1$, epoches $= 2$

step2:- $i = 1$

step3:- $\dfrac{\partial f}{\partial x} = 2x = -2$

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

step 4:- $\Delta x = -\eta \dfrac{\partial f}{\partial x} = -2(-0.1)$

$= 0.2$

$\Delta y = -\eta \dfrac{\partial f}{\partial y} = -(0.1)(2)$

$= -0.2$

step 5:- $x = x + \Delta x$, $y = y + \Delta y$

$= -1 + 0.2$ $= 1 - 0.2$

$= -0.8$ $= 0.8$

step 6:- $i = i + 1$

$= 1 + 1 = 2$

step 7:- if $(i > epoches)$

step 5

else

step 3

step 3:- $\dfrac{\partial f}{\partial x} = 2x = 2(-0.8) = -1.6$

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

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

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

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

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

$$= -0.16$$

Step 5: $x = x + \Delta x$

$$= -0.8 + 0.16$$

$$= -0.64$$

$y = y + \Delta y$

$$= 0.8 - 0.16$$

$$= 0.64$$

Step 6: $i = i + 1$

$$2 + 1 = 3$$

Step 7: if (i > epoches)

   step 8

   else

   step 3

Step 8: $x = -0.64$

$$y = 0.64$$

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

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

$$= 0.4 + 0.4 + 10$$

$$= 10.8 .$$