

## Assignment-2

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

• Do manual calculations for two iterations

• For 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 :-  $\Delta x = -\eta \frac{\partial f}{\partial x} = -2(-0.1)$   
 $= 0.2$

$$\Delta y = -\eta \frac{\partial f}{\partial y} = -(0.1)(2)$$
$$= -0.2$$

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 ( $itr > \text{epochs}$ )  
goto step 5

else  
goto step-3

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

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

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

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

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

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

step 6:-  $itr = itr + 1 = 2 + 1 = 3$

step 7:- if (itr > epochs) 3 > 2  
 goto step 8  
 else goto step 3

step 8:-  $x = -0.64$   
 $y = 0.64$   
 $f(x, y) = x^2 + y^2 + 10$   
 $= (-0.64)^2 + (0.64)^2 + 10$   
 $= 0.4 + 0.4 + 10 = 10.8$