

Manual calculations

Step-1 $f(x, y) = x^2 + y^2 + 10$

calculating derivatives

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

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

Step-2 Initialising parameters

$$x = 1$$

$$y = -1$$

$$\eta = 0.1$$

$$\text{iter} = 1$$

$$\text{epochs} = 2$$

Step-3 $\frac{\partial f}{\partial x} \Big|_{x=1} = 2(1) = 2$

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

Step-4 $\Delta x = -\eta \frac{\partial f}{\partial x} = -(0.1) \times 2 = -0.2$

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

Step-5 $x = x + \Delta x$
 $= 1 + (-0.2) = 0.8$

$$y = y + \Delta y$$

$$= -1 + (0.2) = -0.8$$

Step-6 $\text{iter} = \text{iter} + 1 = 1 + 1 = 2 \leq \text{epochs}$ goto Step 7

Step-7 $\frac{\partial f}{\partial x} \Big|_{x=0.8} = 2(0.8) = 1.6$

$$\frac{\partial f}{\partial y} \Big|_{y=-0.8} = 2(-0.8) = -1.6$$

$$\text{step 8: } \Delta x = -\eta \frac{\partial f}{\partial x} = -(0.1)(1.6) = -0.16$$

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

$$\text{step-9: } x = x + \Delta x$$

$$= 0.8 - 0.16 = 0.64$$

$$y = y + \Delta y$$

$$= -0.8 + 0.16 = -0.64$$

$$\text{step-10: } \text{iter } s = \text{iter } s + 1 = 2 + 1 = 3 > \text{epochs}$$

go to step 11

$$f(x, y) = (0.16)^2 + (-0.16)^2 + 10$$

$$= 10.0512$$