

Manual calculation

$$f(x, y) = 3x^2 + 5e^{-y} + 10$$

Step - 0 $m = 2$, $y = 1$, $\eta = 0.1$, $\text{itermax} = 2$, $\text{iter} = 1$

Step - 1 $m_1 = \frac{\partial f}{\partial x} \Big|_{x=2} = 6x = 6(2) \Rightarrow 12$

$$m_2 = \frac{\partial f}{\partial y} \Big|_{y=1} = -5e^{-1} \Rightarrow -1.839$$

Step - 2

$$\Delta x = -\eta \frac{\partial f}{\partial x} = -\eta m_1 = -(0.1)(12) = -1.2$$

$$\Delta y = -\eta \frac{\partial f}{\partial y} = -\eta m_2 = -(0.1)(-1.839) = 0.1839$$

Step - 3

$$x = x + \Delta x = 2 - 1.2 = 0.8$$

$$y = y + \Delta y = 1 + 0.1839 = 1.1839$$

Step - 4

$$\text{iter} = \text{iter} + 1 = 2$$

Step - 5 if ($\text{iter} \leq \text{itermax}$)

goto Step 2

else

goto Step 7

Step - 6

$$m_1 = \frac{\partial f}{\partial x} = 6x = 6(0.8) = 4.8$$

$$m_2 = \frac{\partial f}{\partial y} = -5e^{-y} = -5e^{-1.1839} = -1.53$$

Step - 7

$$\Delta x = \eta \frac{\partial f}{\partial x} = \eta m_1 = -(0.1)(4.8)$$

$$= -0.48$$

$$\Delta y = -\eta \frac{\partial f}{\partial y} = -\eta m_2 = -(0.1)(-1.53) = 0.153$$

Step ④ $x = x + \Delta x = 0.8 - 0.48 = 0.32$

$$y = y + \Delta y = 1.1839 + 0.153 = 1.3369$$

Step ⑤ $\text{iter} = \text{iter} + 1 = 3$

Step ⑥ if ($\text{iter} > \text{itermax}$)

goto step 7

else

goto step ②

Step ⑦ calculate $f(x, y)$ at x and y

$$x = 0.32 \quad y = 1.3369$$

$$f(x) = 3x^2 + 5e^{-y} + 10$$

$$= 3(0.32)^2 + 5e^{-1.3369} + 10$$

$$= \underline{\underline{11.6204}}$$