19K41A0582
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Assignment - 3

Find the global minimum point and value for the function

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

Manual calculation:

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

step 1: $x = 2,\ y = 1,\ \eta = 0.1,\ \text{terman} = 2,\ \text{iter} = 1$

step 2:

$$m_1 = \left.\frac{\partial f}{\partial x}\right|_{x=2} = 6x = 6(2) = 12$$

$$m_2 = \left.\frac{\partial f}{\partial y}\right|_{y=1} = (-5e^{-1}) = -1.839$$

step 3:

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

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

step 4:

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

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

step 5:

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

step 6:

if (iter <= terman)
goto step 2
else
goto step 7

step 2:

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

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

step 3:

$$\Delta x = -\eta \frac{\partial f}{\partial x} = -\eta m_1 = -(0.1)(4.8) = -0.48$$

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

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step 4: $x = x + \Delta x = 0.8 - 0.48 = 0.32$

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

step 5: iter = iter + 1 = 3

step 6: if (iter > iterman)
goto step 7
else
goto step 2

step 7: Calculate ~~fcn~~ $f(x,y)$ at x and y.

$x = 0.32$, $y = 1.3369$

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

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

$= 10.3072 + 5e^{-1.3369}$

$= 11.6204$