Global Minimum → Manual Calculations
(2 Iterations)

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CSE III A

$f(x) = x^4 + 3x^2 + 10$

random

1) $x = 1$ epochs = 2 $\eta = 0.1$ iter = 1 } initialize

2) $\left.\frac{\partial f}{\partial x}\right|_x = \left. 4x^3 + 6x \right|_{x=1} = 4 + 6 = 10$

3) $\Delta x \propto -\frac{\partial f}{\partial x}$

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

$= (-0.1)(10) = -1.0$

4) $x = x + \Delta x = 1 + (-1) = 0$

5) iter = iter + 1 ⇒ iter = 2

6) if (iter > epochs)

2 > 2 ✗

goto step 2

Iteration 1
(steps)

2) $\left.\frac{\partial f}{\partial x}\right|_x = \left. 4x^3 + 6x \right|_{x=0} = 0$

3) $\Delta x = -(0.1)(0) = 0$

4) $x = x + \Delta x = 0 + 0 = 0$

5) iter = 2 + 1 ⇒ iter = 3

6) if (iter > epochs)

3 > 2 ✓

∴ (out of loop → step 7)

Iteration 2
(steps)

7) print $x, f(x)$ ⇒ ★ At $x = 0$ we got $f(x) = 0 + 0 + 10$

$x = 0, f(x) = 10$

★ Global Minimum value of $f(x) = 10$ at $x = 0$