Q: Find the global minimum point & value
for the function.
$$f(x) = x^4 + 3x^2 + 10$$

Sol: iteration1:
step: $\eta = 0.001$

$X_0 = 10$ iterations = 2
iterations = 0

Step 2: Calculation of slope
$$\frac{\partial f(x)}{\partial x} = 4x^3 + 6x$$

$$\frac{\partial f(x)}{\partial x}\Big|_{10} = 4 \times (10)^3 + 6(10) = 4 \times 1000 + 60$$
$$= 4060$$

Step 3: $\Delta x = -\eta \cdot \partial f(x)/\partial x = 4.06$

step 4: change in variable value

$$\Delta x = -(0.001)(4060)$$

$$\Delta x = -4.060$$

Step 4: $x = x + \Delta x = 10 - 4.060$

$$x = 5.94$$

Step 5: iter = 0 + 1 = 1

Step 6: if (iter >= iterations)
$$1 >= 2$$
false

$x = 5.94$ goto step 2.

Step 2: $\frac{\partial f(x)}{\partial x} = 4 \times (5.94)^3 + 6(5.94)$

$$= 838.336336 + 35.64$$

$$= 873.978336$$

Step 3: $\Delta x = -(0.001) \times 873.978336$

$$= -0.873978336.$$

Step 4: $x = 5.94 - 0.873978336 = 5.066021664$

step 5: iter: 1+1-2

step 6: ~~iter~~ iteration

      2 > 2

     True

$\Rightarrow$ print $(5.06602166\,4)^4 + 3 \times (5.066021664)^2 + 10$

$\rightarrow$ $658.67043560\,1226 + 76.993726500\,85199 + \cancel{10}$

$\Rightarrow$ $\underline{745.664}$

Min Value at $f(x) = 745$ at $x = 5$