Assignment - 1.

find the global minimum point & value for

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

→ Do manual calculations for two iterations.

→ find the Optimal solution using python programming.

iteration = 0 , N = 2.

Sol: Step 1 :- $x = 5$, $\eta = -0.001$, $f(x) = x^4 + 3x^2 + 10$

Step 2: Slope Calculation $\dfrac{df}{dx} = 4x^3 + 6x \Big|_{x=5}$

$= 530$.

Step 3: $\Delta x = \eta \cdot \dfrac{df}{dx}$

$= -(-0.001)(530)$

$= 0.53$

Step 4: $x = x + \Delta x$

$= 5 + 0.53 = 5.53 //$

$= 0.0066$.

Step 5: iteration = iteration + 1 = 1.

Step 6: if (iteration > N)

$1 > = 2$.

false, Repeat from step 2.

$(x = 5.53)$

Step 2: $\dfrac{\partial f}{\partial x}\Big|_{x=5.53} = 4x^3 + 6x \Big|_{x=5.53}$

$$= 4(5.53)^3 + 6(5.53)$$

$$= 709.629 //$$

Step 3: $\Delta x = -\eta \cdot \dfrac{\partial f}{\partial x} = -(-0.001)(709.629)$

$$= 0.7096$$

Step 4: $x = x + \Delta x = 5.53 + 0.7096$

$$= 6.2396 //$$

Step 5: iteration = iteration + 1

$$= 2.$$

Step 6: if (iteration >= N)

$$2 >= 2.$$

True

Minimum value at $x = 6.2396$ is $1642.545 //$