

Assignment - 3 manual calculation
Given :- Gradient Descent Optimization
 $f(x) = x^4 + 3x^2 + 10$

step 1 :- $\eta = 0.1$, iteration_{max} = 2

$$x = 2$$

step 2 :-

$$m = \frac{df}{dx} \bigg|_{x=2}$$

$$4x^3 + 6x = 4(2)^3 + 6(2)$$
$$= 4(8) + 12$$

$$= 32 + 12 = 44$$

iteration = 1

step 2 :- $\Delta x = -0.1(44)$
 $= -\frac{1}{10}(44)$

$$\Delta x = -4.4$$

iteration = iteration + 1 = 2

$$x = 2 - 4.4 = -2.4$$

if (2 > 2)

{ else

}

$$\eta = 0.1, \quad x = -2.4$$

$$m = 4(-2.4) + 6(-2.4)$$

$$m = -24 - 14.4 = -38.4$$

$$\Delta x = -0.1(-38.4)$$

$$= 3.84$$

iteration = 2

$$x = -2.4 + 3.84 = 1.44$$

iteration = 2 + 1 = 3

if (3 > 2) // condition is satisfied

$$\text{print } x = 4.56 = 4.6$$

$$f(x) = (4.6)^4 + 3(4.6)^2 + 10$$

$$f(x) = 521.22 \leq 6$$

The optimal solution by the manual calculation

$$f(x) = 521.22 \leq 6.$$