P.E-II NNDL

Assignment -1

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Step:1

Given

$y = x^4 + 3x^2 + 10$

calculate derivative of y with respect to x.

$\Rightarrow \frac{\partial y}{\partial x} = \frac{\partial}{\partial x}(y) = \frac{\partial}{\partial x}(x^4 + 3x^2 + 10)$

$\frac{\partial y}{\partial x} = 4x^3 + 6x$

Step:2: Initializing x value, number of ~~values~~ maximum iterations and learning rate η

$\Rightarrow x = 1$

$\eta = 0.1$

no.of. iters = 1

max_iters = 2

Step 3:- Calculate $\frac{\partial y}{\partial x}$ when $x = 1$

$\therefore \frac{\partial y}{\partial x}\Big|_{x=1} = 4x^3+6x\Big|_{x=1}$

$= 4(1)^3+6(1) = 4+6 = 10$

<u>Step:4</u> Calculate change in x i.e Δx

Δx can be calculated using formula

$$\Delta x = -\eta \frac{dy}{dx}$$

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

$$= -\frac{1}{\cancel{10}} \times \cancel{10} = -1$$

$$\therefore \Delta x = -1$$

<u>step:5</u> add change in x to x i.e

perform $x+\Delta x$

$\Rightarrow x+\Delta x = 1-1 = 0$

no. of iters = no. of iters + 1

<u>Step:6</u> If no. of iters > max_iters

stop calculations else repeat steps with updated x value i.e $x=0$

: $2>2 \Rightarrow$ false

$\therefore$ repeat step 3 with $x=0$

step :- 7

$$\frac{\partial y}{\partial x}\Big|_{x=0} = 4x^3+6x\Big|_{x=0}$$

$$= 4(0)+6(0)=0$$

step : 8 calculate change in x (Δx) when $x=0$.

$$\therefore \Delta x = -\eta \frac{dy}{\partial x}$$

$$= -(0.1)(0)$$

$$= 0$$

Step : 9 - update x as adding Δx to x

$$\Rightarrow x+\Delta x = 0+0=0$$

step :- 10 :- increment no. of iterations

no. of . iters = no. of. iters + 1

step : 11 if no of iters > max-iters, stop process else repeat step 3

Here $3>2$

Hence stop the process

Step :- 12 $\therefore$ slope = 0

Point at which slope = 0 $\Rightarrow$ y(0)

$$= x^4+3x^2+10\Big|_{x=0}$$

$$= 0+3(0)+10$$

$$= 0+10$$

point at slope $\to$ 0 $\Rightarrow$ 10 $\Rightarrow$ GLOBAL MINIMUM