Assignment-I

18K41A05F4

Find the global minimum point and value for the function $f(x) = x^4 + 5x^2 + 10$.

1) Do Manual Calculations for two iterations

Step 1 :- Initialization

$\eta = 0.01$, $x = 6.5$, epoches = 2., iter = 1

Step 2 :- 1st order derivative of $f(x)$ at $x = 6.5$

$$\left(\frac{\partial f}{\partial x}\right)_{x=6.5} = (4x^3 + 6x)_{x=6.5}$$

$$= 1098.5 + 39$$

$$= 1137.5 \text{ //.}$$

Step 3 :- Find changing variable

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

$$= -(0.01)(1137.5)$$

$$\Delta x = -11.375 \text{ //.}$$

Step 4 :-

$$x = x + \Delta x$$

$$= 6.5 + (-11.375)$$

$$x = -4.875 \text{ //.}$$

Step 5 :- itr = itr + 1
= 1 + 1
itr = 2.

Step 6 :- if (itr > epoches)
goto step 7
else
goto step 2.

2 > 2 ; its false so goto step 2.

Step 2 :-

$\left(\frac{\partial f}{\partial x}\right)_{x=-4.8} = (4x^3+6x)_{x=-4.8} = -492.67$ //.

Step 3 :- $\Delta x = -\eta \frac{\partial f}{\partial x} = -(0.01)(-492.67)$

$\Delta x = 4.9$ //.

Step 4 :- $x = x + \Delta x$
$= -4.8 + 4.9$
$x = 0.1$ //.

Step 5 :- itr = itr + 1
= 2 + 1
itr = 3

Step 6 :- if (itr > epoches)
goto step 7
else
goto step 2.

3 > 2 ; its true so goto step 7

Step 7 :- $x = 0.1$

$x^4 + 3x^2 + 10 = (0.1)^4 + 3(0.1)^2 + 10$

$= 10.0301$ //.