

Assignment-2

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

Manual Calculation:

Step 1:  $x = 4, \eta = 0.1, \text{itermax} = 2, \text{iter} = 1$

Step 2:  $m = \frac{\partial f}{\partial x} \Big|_{x=4} = 4x^3 + 6x = 4(4)^3 + 6(4) = 256 + 24 = 280$

Step 3:  $\Delta x = -\eta \frac{\partial f}{\partial x} = -(0.1)(280) = -28$

Step 4:  $x = x + \Delta x = 4 - 28 = -24$

Step 5:  $\text{iter} = \text{iter} + 1 = 2$

Step 6: if ( $\text{iter} > \text{itermax}$ )  
goto step 7  
else  
goto step 2

Step 2:  $m = \frac{\partial f}{\partial x} \Big|_{x=-24} = 4x^3 + 6x = 4(-24)^3 + 6(-24) = (-47520 - 144)$

Step 3:  $\Delta x = -\eta \frac{\partial f}{\partial x}$   
 $= -(0.1)(-47520 - 144)$   
 $= 4754.64$

Step 4:  $x = x + \Delta x$   
 $= -24 + 4754.64$   
 $= 4730.64$

Step 5:  $\text{iter} = \text{iter} + 1 = 3$

Step 6: if ( $\text{iter} > \text{itermax}$ )  
goto step 7

else  
goto step 2.

step 7: Calculate  $f(x)$  at  $x$

$$x = 4731.82$$

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

$$= (4731.82)^4 + 3(4731.82)^2 + 10$$

$$= 5.013 \times 10^{14} + 67170371.54$$

$$= 5.013000672 \times 10^{14}$$

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