

EXERCISE 1: FIND THE GLOBAL MINIMUM

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

→ Manual calculations for iterations

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

$$\text{let } x=2 ; \eta=0.01$$

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

$$\textcircled{1} \rightarrow \left. \frac{\partial f(x)}{\partial x} \right|_{x=2} = 4(2)^3 + 6(2) = 44$$

$$\frac{32}{44}$$

$$\begin{aligned} \Delta x &= -\eta(44) \\ &= -0.01(44) \\ &= -0.44 \end{aligned}$$

$$\begin{aligned} \rightarrow x &= x + \Delta x \\ &= 2 - 0.44 \\ &= 1.56 \end{aligned}$$

$$\textcircled{2} \rightarrow \left. \frac{\partial f(x)}{\partial x} \right|_{x=1.56} = 4(1.56)^3 + 6(1.56) = 24.545$$

$$\Delta x = -0.01 \times 24.54$$

$$f(1.56) = 24.54$$

$$\begin{aligned} x &= x + \Delta x \\ &= 1.56 - 0.2454 \\ &= 1.314 \end{aligned}$$