Assignment 2

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

Iteration 1 :

① choose intial value for x and η.

$x = 1, \eta = 0.1$

② Gradient calculation.

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

$$= 4(2)^3 + 6(2) = 44$$

③ step length.

$$\Delta x = -\eta \left(\frac{\partial f(x)}{\partial x}\right) = -(0.1)(44)$$

$$= -4.4$$

④ update x value

$$x = x + \Delta x$$

$$= 1 - 4.4 = -3.4$$

Iteration 2 :

① Gradient calculation for $x = -3.4$

$$\frac{\partial f(x)}{\partial x} = 4(-3.4)^3 + 6(-3.4) = -177.61$$

② Step length.

$$\Delta x = -\eta \left(\frac{\partial f(x)}{\partial x}\right) = -(0.1)(-177.61)$$

$$= 17.7$$

③ update x value

$$x = x + \Delta x$$
$$= -3.4 + 17.7$$
$$= 14.3$$

→ This procedure repeats until gradient is near to zero.