Newton –Raphson method

$$F(x_0 + \delta x) = F(x_0) + F`(x_0)\delta x + O(\delta x^2) = 0$$
$$\delta x \approx -\frac{F(x_0)}{F`(x_0)}$$

$$F(\phi) = N^+ + n_{int}e^{-\frac{\phi}{V_T}} - n_{int}e^{\frac{\phi}{V_T}} = 0$$

$$F`(\phi) = -\frac{n_{int}}{V_T}\left(e^{-\frac{\phi}{V_T}} + e^{\frac{\phi}{V_T}}\right)$$

The number of repetition = 1000
The initial value of ϕ = ± 0.5

- Analytic solution and numerical method are almost same.