problem 3-4

Back to basic Newton's method:

$$x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)}$$

the theorem behind this is that we suppose $f(x)$ is a continuous function, and we want to find x_0 such that $f(x_0) = 0$

$$\Rightarrow f(x) = 0 = f(x_0) + f'(x_0)\cdot(x - x_0) + \cancel{O((x-x_0)^2)}$$

$$\Rightarrow f(x_0) + f'(x_0)(x - x_0) = 0$$

$$\Rightarrow x - x_0 = -\frac{f(x_0)}{f'(x_0)}$$

$$\Rightarrow x = x_0 - \frac{f(x_0)}{f'(x_0)}$$, until it converge.

Now in Newton-Raphson, we could see $f = \nabla E(w)$

$$\Rightarrow W_{k+1} = W_k - \frac{\nabla E(w)}{\nabla\nabla E(w)} = W_k - H^{-1}\cdot \nabla E(w)$$, which $H^{-1} = \nabla\nabla E(w)$ #

Since in Newton's method, it already prove it will converge to global minimum, so the Newton-Raphson can also reach the same result #