$$y = w_0 + w_1 x \quad \text{Cost}$$

$$\min_{w_0, w_1} \left(\sum_{n=1}^{N} \left((w_0 + w_1 x_n) - t_n \right)^2 \right)$$

$$= \min_{w_0, w_1} \left(\underbrace{\frac{1}{2} \sum_{n=1}^{N} \left((w_0 + w_1 x_n) - t_n \right)^2}_{E(w_0, w_1)} \right)$$

$$\nabla E(w_0, w_1) = \begin{bmatrix} \frac{\partial E}{\partial w_0} \\ \frac{\partial E}{\partial w_1} \end{bmatrix}$$

$$\nabla^2 E(w_0, w_1) = \text{Hessian} = \begin{bmatrix} \frac{\partial^2 E}{\partial w_0^2} & \frac{\partial^2 E}{\partial w_0 \partial w_1} \\ \frac{\partial^2 E}{\partial w_1 \partial w_0} & \frac{\partial^2 E}{\partial w_1^2} \end{bmatrix}$$

For E to be convex, $\nabla^2 E(w_0, w_1)$ should be positive & semidefinite

For a function to be +ve, semidefinite ~~is~~ one way is

1. Eigen values are non negative
2. The first & second leading minors have same sign (i think)