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To prove a function is convex, we should prove that

for any  $n$ -dimension row vector  $V$ ,  $V H V^T$  is always greater than 0. where  $H$  is the Hessian Matrix of the vector

$$H_{jk} = \sum_{i=1}^m P(1-P) x_j^{(i)} x_k^{(i)}$$

$$\underline{V^T H V} = \sum_{i=1}^m P(1-P) \left( \sum_{j=1}^n V_j x_j^{(i)} \right)^2$$

⊛ we get (did in rough)

+ve +ve ⇒ Always  $\geq 0$

∴ Error function is always a convex function.