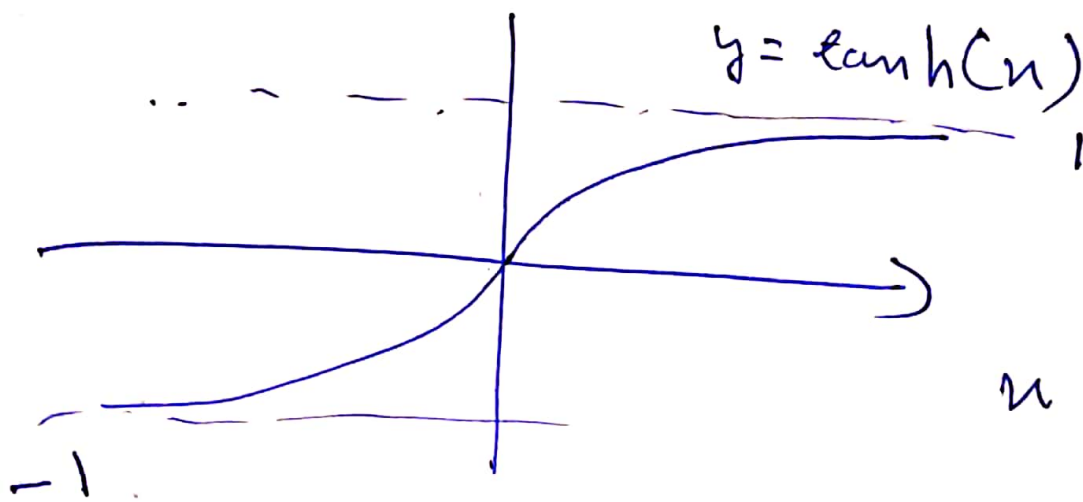


A1) If the origin is present in the weight space then its output would be zero. $\tanh(0) = 0 \Rightarrow$ the output after applying activation will also be zero.



Because of the MSE error the gradients will be 0 which leads to no ~~update~~ update of weights of during backpropagation. That's why this will be a stationary point of the error function.

A2) a)

$$E = \frac{1}{2} \lambda_1 \omega_1^2 + \frac{1}{2} \lambda_2 \omega_2^2$$

$$\frac{\partial E}{\partial \omega_1} = \lambda_1 \omega_1$$

$$\frac{\partial E}{\partial \omega_2} = \lambda_2 \omega_2$$

$$\frac{\partial E}{\partial \omega_1, \partial \omega_2} = 0$$

$$\frac{\partial E}{\partial \omega_2 \partial \omega_1} = 0$$

$$H = \begin{bmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{bmatrix}$$

$$\det(H - \lambda I) = 0$$

$$\Rightarrow \begin{vmatrix} \lambda_1 - \lambda & 0 \\ 0 & \lambda_2 - \lambda \end{vmatrix} = 0$$

$$(\lambda_1 - \lambda)(\lambda_2 - \lambda) = 0$$

λ_1 & λ_2 are roots of this &
eigen values of Hessian.