Similarly expand eq-(3)

$$x^T(\theta_2 - \theta_1) - \left(\frac{\|\theta_2\|^2 - \|\theta_1\|^2}{2} \right) < 0. \quad \text{—(5)}$$

⇒ So condition (4), (5) is a separator (hyperplane) which gives >0 for all $x \in C_1$ and <0 for all $x \in C_2$

Hence we have derived and thus proven the existence of our hyperplane.

where

$$\theta_1 = \frac{\sum_{i=1}^{m} x^i}{m} \qquad \theta_2 = \frac{\sum_{i=m+1}^{n} x^i}{n-m}$$