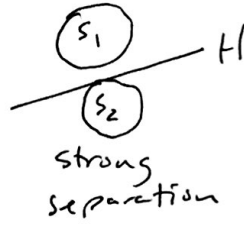


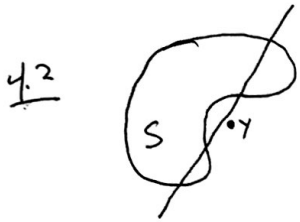
4.1  $\alpha$   $(s_1)$   
 $p_{Tx} = \alpha$   $(s_2) \leq \alpha$   
 strict separation  $\uparrow$



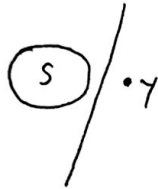
$s_1$   $s_2$   $H$   
 improper separation



$s_1$   $s_2$   $H$   
 proper separation

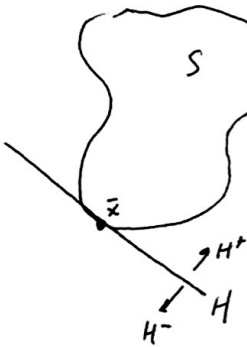


$S$  not convex  
 $\Rightarrow$  no hyperplane

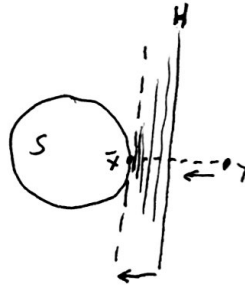


$S$  is convex  
 $\Rightarrow$  hyperplane

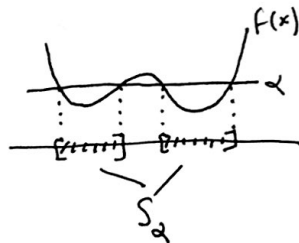
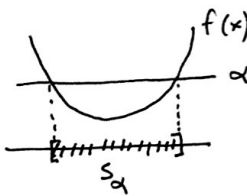
4.3



4.4



4.5



4.6



4.7

$$\nabla f(x) = \begin{bmatrix} \frac{\partial f}{\partial x_1}(x) \\ \vdots \\ \frac{\partial f}{\partial x_n}(x) \end{bmatrix} \in \mathbb{R}^n$$

4.8

