$$\boxed{Ax \leq b}$$

$$\begin{cases} a_1^T x \leq b_1 \\ a_2^T x \leq b_2 \\ \vdots \\ a_m^T x \leq b_m \end{cases}$$

$$H = \{x \mid a^T(x - x_0) = 0\}$$
$x \in R^n,\ x_0 \in H$

(1). Degree of freedom H : n-1
(Simplest nontrivial) exp of R^n space.

(2). H separate the space into 3 parts.

$S_1 = \{x \mid a^T(x - x_0) > 0\}$

$S_2 = \{x \mid a^T(x - x_0) < 0\}$

$H \sqcup S_1 \cup S_2$ whole space.

(3). H, S_1, S_2 all are convex

(4). $\forall.\ y \in H.\quad a^T(y - x_0) = 0.$

$\forall\ y \in S_1,\quad a^T(y - x_0) > 0.$

$\forall\ y \in S_2,\quad a^T(y - x_0) < 0.$

(5). $\tilde{H} = \{x \mid \begin{bmatrix} a_1^T \\ a_2^T \end{bmatrix} x = 0,\ x \in R^n\}$

$S_4 = \{x \mid \begin{bmatrix} a_1^T \\ a_2^T \end{bmatrix} x < 0,\ x \in R^n\}$

Cone: $S_5 = \{[a_1\ a_2]\begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix} \mid \theta_1, \theta_2 \geq 0\}$

Given a $y \in S_5$, $y^T x \leq 0,\ \forall x \in \cancel{\tilde{H}}\ S_4$