$$
\begin{tikzcd}
 & \succsim \arrow[d] & \\
 & u(\cdot) \arrow[dl] \arrow[dr] & \\
x(p,w) \arrow[d] \arrow[rr, dashed, leftrightarrow] & & h(\bar{u},p) \arrow[d] \\
v(p,w) \arrow[u, bend left, "\text{Roy}"] \arrow[rr, leftrightarrow] & & e(\bar{u},p) \arrow[u, bend right, "\nabla_p e = h"']
\end{tikzcd}
$$

$\lambda = \partial v / \partial w$

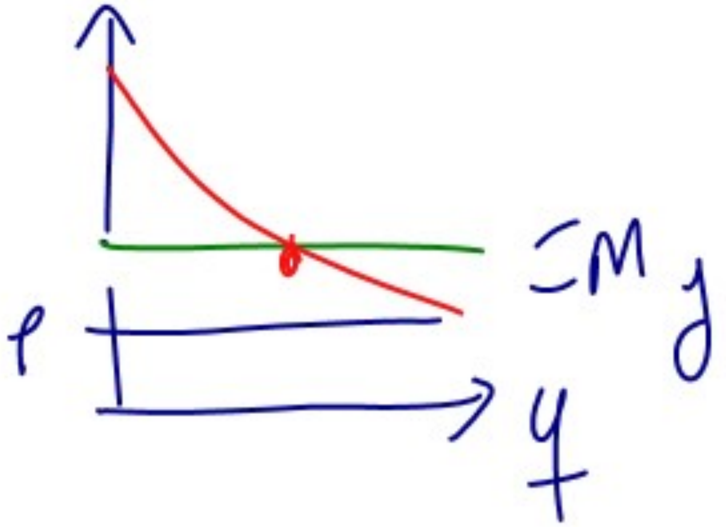
$\tilde{\lambda} = \dfrac{\partial e}{\partial \bar{u}}$

PRODUCTOR

$$\max_{\{y \in Y\}} p \cdot y$$

$$\pi(q) = q \cdot p - CT(q)$$

$$p = CM_g(q)$$



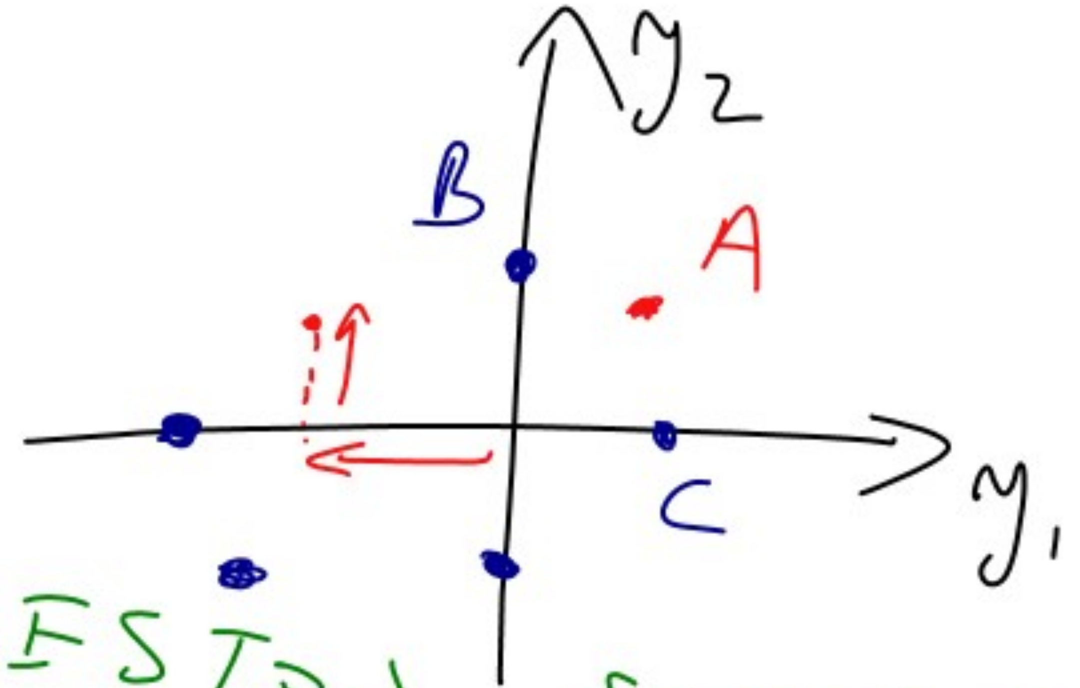
$$\min_{\{z\}} W \cdot z \quad \text{s.a. } q = f(z)$$

$$\downarrow$$

$$z(q, W)$$

$$\downarrow$$

$$c(q, W) = W \cdot z(q, W)$$



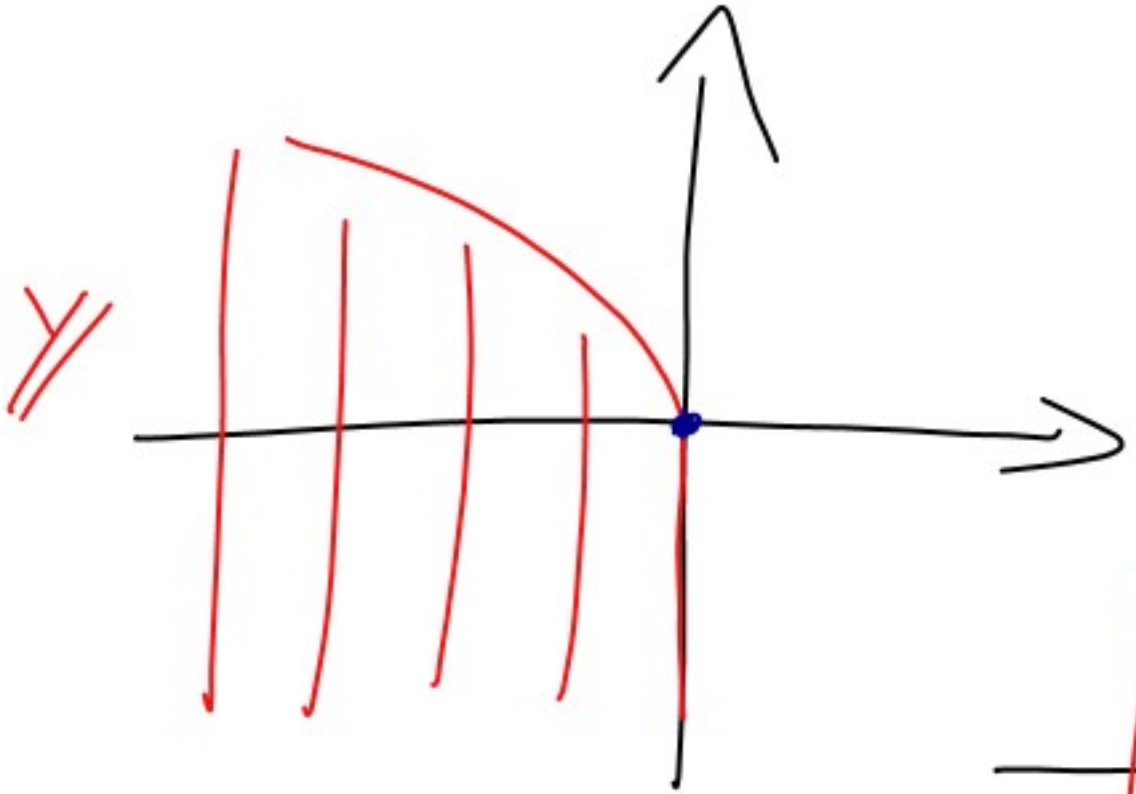
$$\mathcal{Y} \subset \mathbb{R}^m$$

$$\begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_m \end{pmatrix} = y \in \mathcal{Y}$$

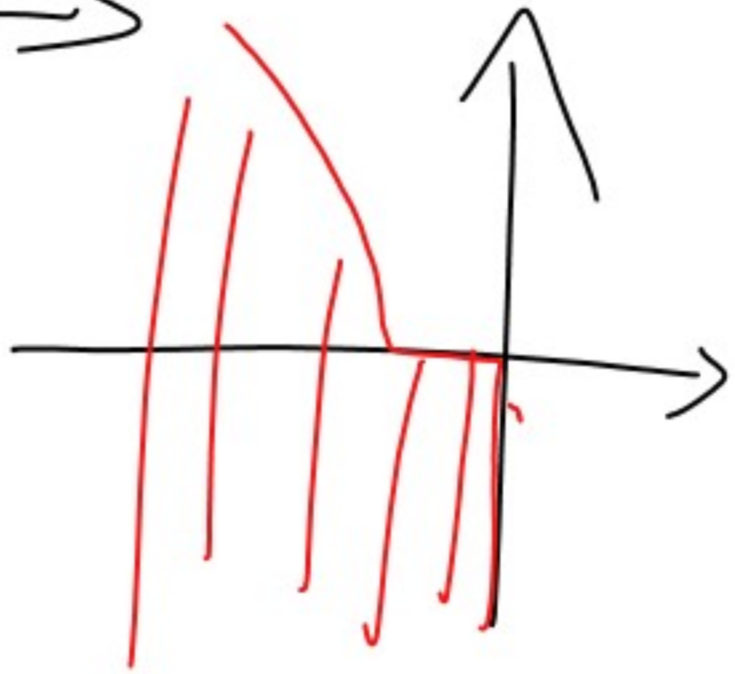
SUPUESTOS SOBRE $\mathcal{Y}$

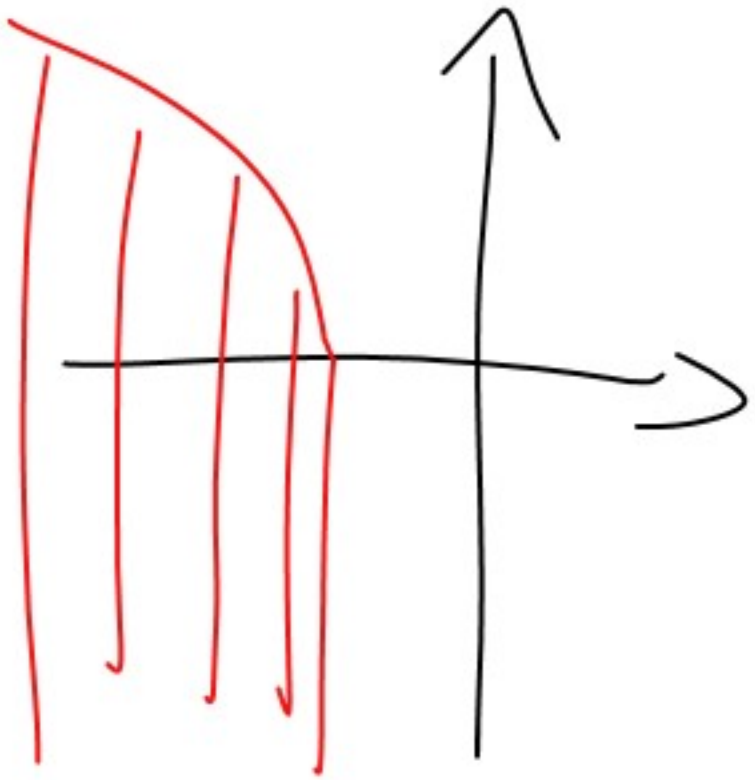
(1) NO FREE LUNCH

$$\mathcal{Y} \cap \mathbb{R}^m_+ \subseteq \{0\}$$



$0 \in \mathbb{Y}$: INACCIÓN ES POSIBLE





$$\max_{\{y\}} p \cdot y \quad \text{s.a} \quad y \in Y \qquad p \cdot y = \sum_j p_j y_j$$

$$y(p)$$

$$y(\alpha p)\,\alpha p \geq y\,\alpha p \quad \forall\, y \in Y$$

$$y(\alpha p) = y(p) \qquad \text{H.G.0}$$

$$\mathcal{L} = u(X) + \lambda(I - P\cdot X)$$

C.P.O. $\dfrac{\partial u}{\partial X_i} = \lambda p_i$

$$v = u(X(p,I))$$

$$\frac{\partial v}{\partial I} = \sum_i \frac{\partial u}{\partial X_i}\cdot\frac{\partial X_i}{\partial I}$$

$$= \lambda \sum_i p_i \frac{\partial X_i}{\partial I}$$

$$\frac{\partial}{\partial I} P\cdot X(p,I) = \frac{\partial I}{\partial I} = 1 = \frac{\partial}{\partial I}\sum_i X_i(p,I)\,p_i = \sum_i p_i \frac{\partial X_i(p,I)}{\partial I}$$

$$\frac{\partial v}{\partial I} = \lambda 1.$$

$$\mathcal{L} = -W\cdot Z + \hat{\lambda}(-y + f(z))$$

C.P.O. $w_i = \partial f/\partial z_i \cdot \hat{\lambda}$

$$c(w,y) = W\cdot Z(w,y)$$

$$\mathcal{L} = -W \cdot z + \hat{\lambda}\left(-y + f(z)\right)$$

C.P.O. $w_i = \partial f / \partial z_i \cdot \hat{\lambda}$

$$c(w, y) = W \cdot z(w, y)$$

$$\frac{\partial c}{\partial y} = \frac{\partial}{\partial y} W \cdot z = \frac{\partial}{\partial y}\left(\sum_i w_i z(w, y)\right) = \sum_i w_i \frac{\partial z_i(w, y)}{\partial y}$$

$$= \hat{\lambda} \sum_i \frac{\partial f}{\partial z_i} \cdot \frac{\partial z_i}{\partial y}$$

$$y = f(z)$$

$$\frac{\partial y}{\partial y} = 1 = \frac{\partial f}{\partial z_1}\frac{\partial z_1}{\partial y} + \frac{\partial f}{\partial z_2} \cdot \frac{\partial z_2}{\partial y} + \dots + \frac{\partial f}{\partial z_m} \cdot \frac{\partial z_m}{\partial y} = \sum_i \frac{\partial f}{\partial z_i} \cdot \frac{\partial z_i}{\partial y}$$