$$\mathcal{L} = f(\xi) \mp \lambda\left(c - g(\xi)\right)$$

$$\underset{\{\xi\}}{\mathrm{MAX}} \quad f(\xi)$$

$$\text{s.a.} \quad -g(\xi) = -c$$

$$\max_{\{z\}} \; -z \cdot w \qquad w \cdot z = \sum w_i z_i$$

$$\text{s.t.} \quad q = f(z)$$

$$\mathcal{L} = -z \cdot w + \lambda\left(f(z) - q\right)$$

$$\lambda = CM_q$$

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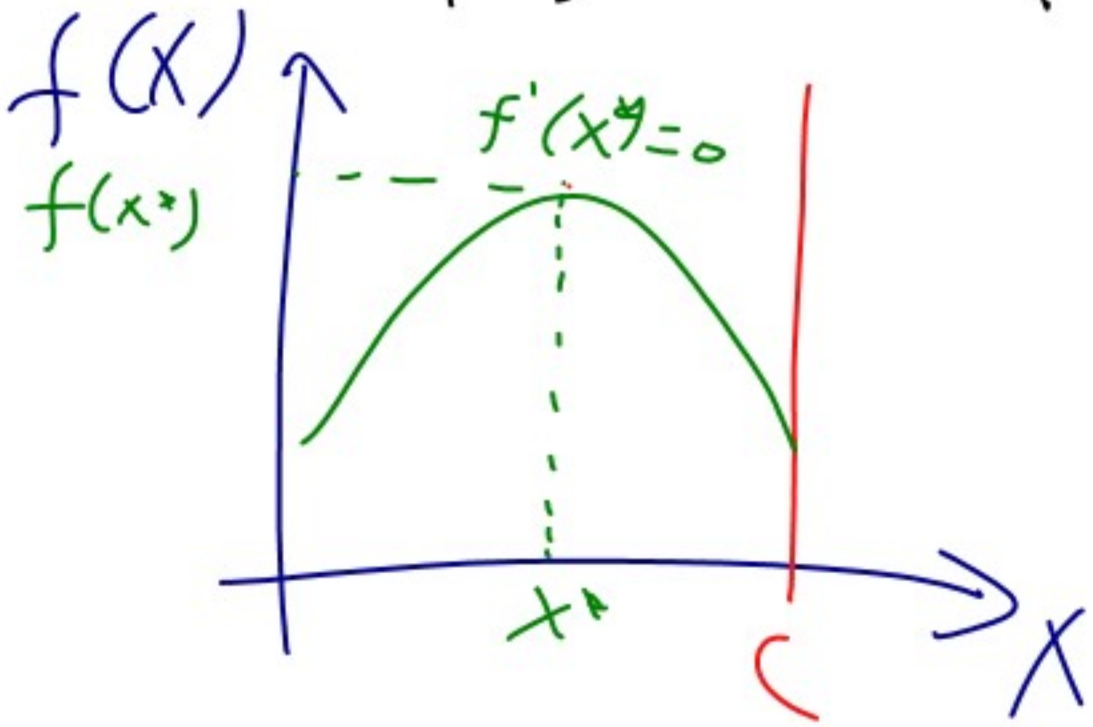
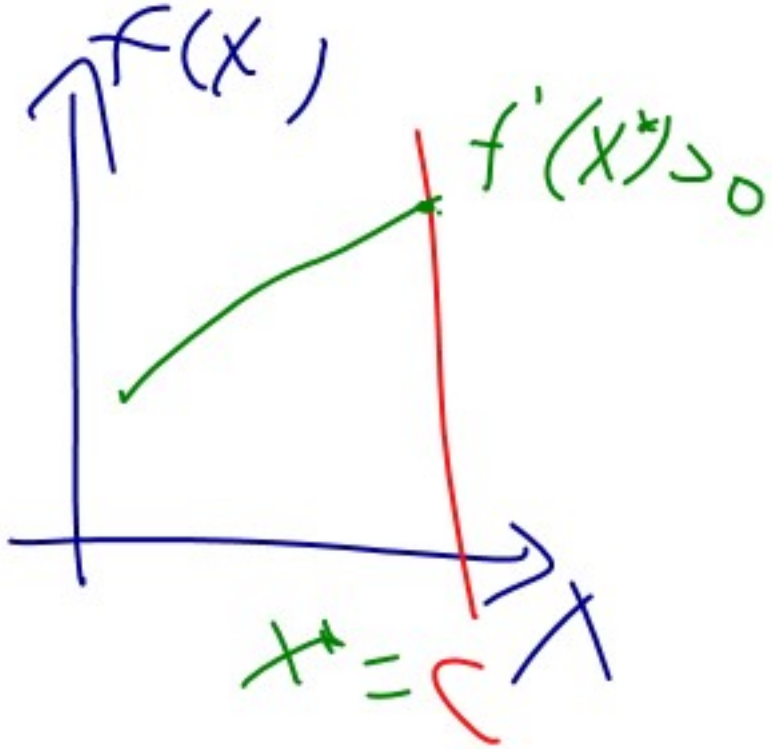
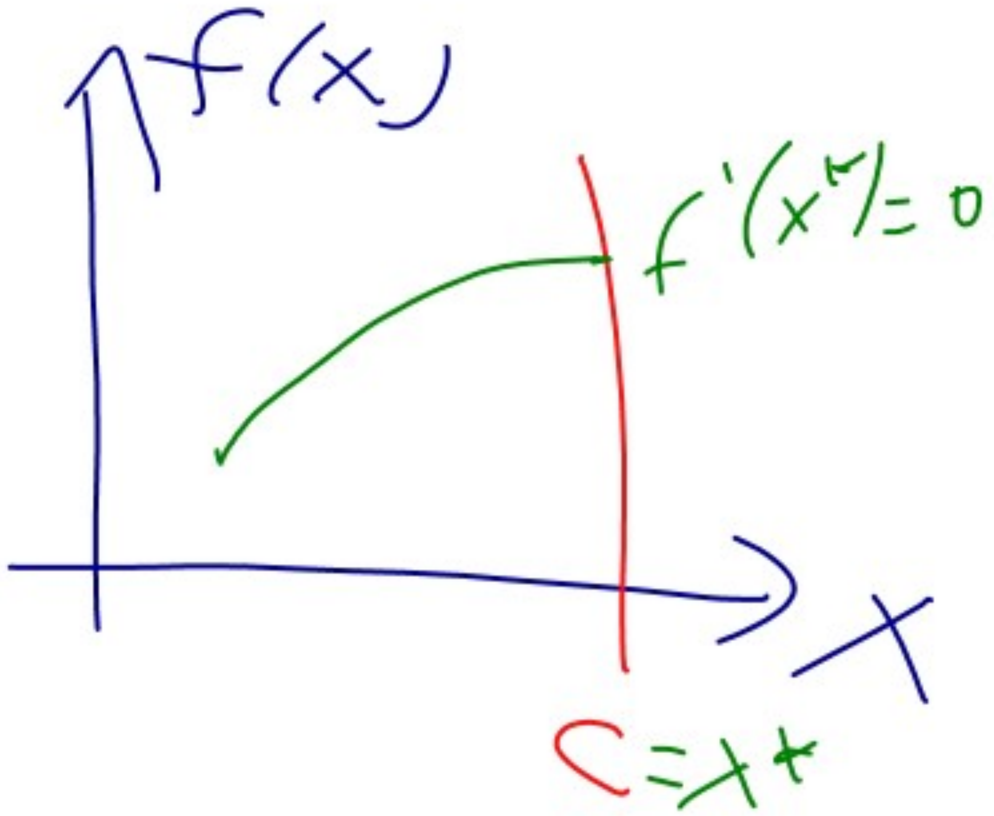
$$\max_{\{x\}} f(x) \qquad x \leq c$$

$$\boxed{f'(x^*)(c - x^*) = 0}$$







$$\underset{\{x\}}{\mathrm{MAX}}\ f(x) \qquad f: \mathbb{R}^n \longrightarrow \mathbb{R}$$

$$x \longrightarrow f(x)$$

s.a. $g_k(x) = c_k \quad k = 1, 2, \dots K$

$h_\ell(x) \leq d_\ell \quad \ell = 1, 2, \dots L$

COND. K-T

① $$\frac{\partial f(x^*)}{\partial x_i} = \sum_{k=1}^{K} \lambda_k \frac{\partial g_k(x^*)}{\partial x_i} + \sum_{\ell=1}^{L} \gamma_\ell \frac{\partial h_\ell(x^*)}{\partial x_i}$$

$i = 1, 2, \dots n$

② $\lambda_k \in \mathbb{R}$ $\quad k = 1, 2, \dots K$

$\gamma_\ell \in \mathbb{R}_+$ $\quad \ell = 1, 2, \dots L$ $\qquad \gamma_\ell (h_\ell(x^*) - b_\ell) = 0$

1 CUASI LINEALES: $u(x,y) = x + y^{\alpha}$

$0 < \alpha < 1$

$$\max_{\{x,y\}} \; x + y^{\alpha}$$

s.a. $p_x x + p_y y = I$

$-x \leq 0$

$-y \leq 0$

① $$\frac{\partial (x+y^{\tau})}{\partial x} = \frac{\partial \lambda(-p_x x - p_y y + I)}{\partial x} + \gamma_1 \frac{\partial(-x)}{\partial x} + \gamma_2 \frac{\partial(-y)}{\partial x}$$

$$\frac{\partial (x+y^{\tau})}{\partial y} = \frac{\partial \lambda(-p_x x - p_y y + I)}{\partial y} + \gamma_1 \frac{\partial(-x)}{\partial y} + \gamma_2 \frac{\partial(-y)}{\partial y}$$

② $\gamma_1 \geq 0 \qquad \gamma_1(-x-0)=0$

$\gamma_2 \geq 0 \qquad \gamma_2(-y-0)=0$

① $1 = -\lambda(P_x) - \gamma_1$ $\quad \gamma_1 x = 0 \quad \gamma_1 \geq 0$

$\alpha y^{\alpha-1} = -\lambda P_y - \gamma_2 \quad \gamma_2 y = 0 \quad \gamma_2 \geq 0$

Ⓐ $\gamma_1 > 0, \ \gamma_2 > 0$

$x^* = 0 \quad y^* = 0$

Ⓒ $\gamma_1 = 0, \ \gamma_2 > 0$

$x^* > 0 \quad y^* = 0$

$\alpha(0)^{\alpha-1} = -\lambda P_y \Rightarrow \Leftarrow$

Ⓑ $\gamma_1 > 0, \ \gamma_2 = 0$

$x^* = 0 \quad y^* > 0$

$1 = -\lambda P_x - \gamma_1$

$\alpha y^{\alpha-1} = -\lambda P_y$

$I = P_y y^* \Rightarrow y^* = \frac{I}{P_y}$

Ⓓ $\gamma_1 = 0, \ \gamma_2 = 0$

$\rightarrow \gamma_1 = -1 - \lambda P_x$

$\rightarrow \lambda = -\alpha\left(\frac{I}{P_y}\right)^{\alpha-1} \frac{1}{P_y}$

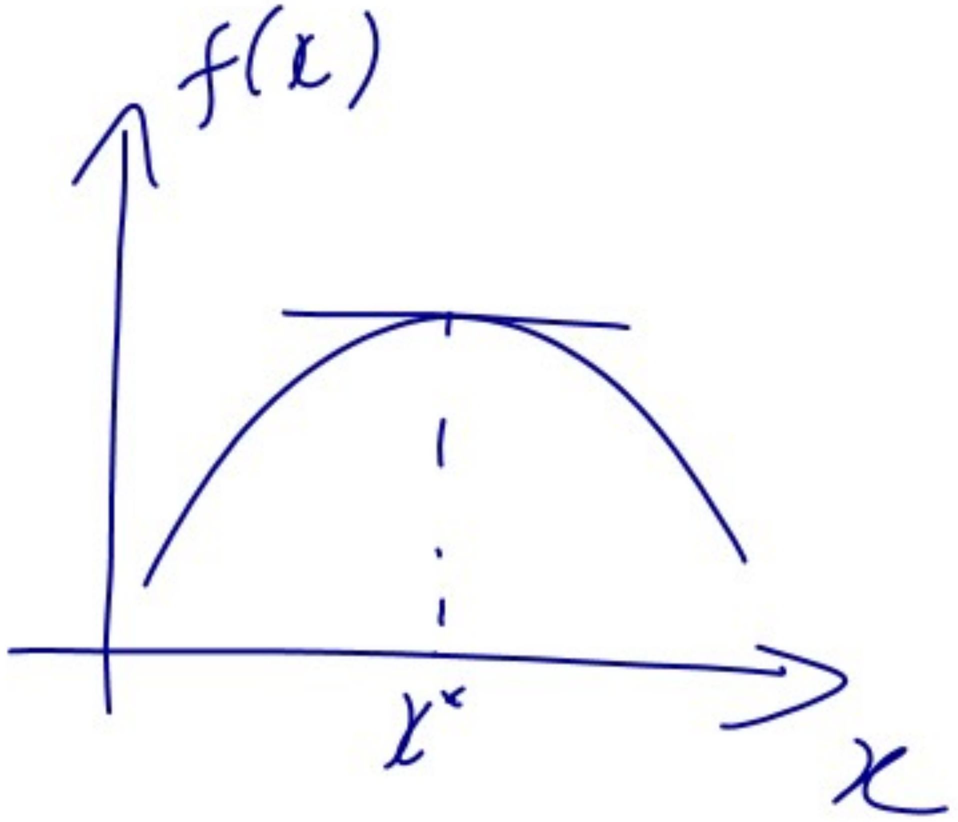
$\gamma_1 = -1 + \alpha \frac{P_x}{P_y}\left(\frac{I}{P_y}\right)^{\alpha-1} > 0$

$$\gamma_1 = -1 + \alpha \frac{p_x}{p_y}\left(\frac{I}{p_y}\right)^{\alpha-1} > 0$$

$$\frac{\alpha p_x}{p_y}\left(\frac{I}{p_y}\right)^{\alpha-1} > 1$$

$$\frac{\alpha p_x}{p_y \, p_y^{\alpha-1}} > I^{1-\alpha}$$

$$\left(\frac{\alpha p_x}{p_y^{\alpha}}\right)^{\frac{1}{1-\alpha}} > I$$



c.1.o $f'(x^*) = 0$

$\cancel{f'(x) = 0}$