$\min f(x)$ $\quad Ax = b$

$d_L \le Cx \le d_U \to Cx - s = 0$] Ig.

$l \le x \le u$

$d_L \le s \le u$] caix.

$s \equiv Cx$

$\min f(x) \quad Ax = b, \; i = 1,\dots,m \qquad Cx \le d, \; i = m+1,\dots,m+p \qquad A \in \mathbb{R}^{m\times n}, \; C \in \mathbb{R}^{p\times n}$

$\mathcal{A}(x) = \{ i : c_{i-m}^T x = d_i, \; i = m+1,\dots,m+p\} \cup \{1,\dots,m\}$

$\min f(x)$ s.a $Ax = b$, $C_{\mathcal{A}} x = d_{\mathcal{A}}$ — olhar só para as ativas

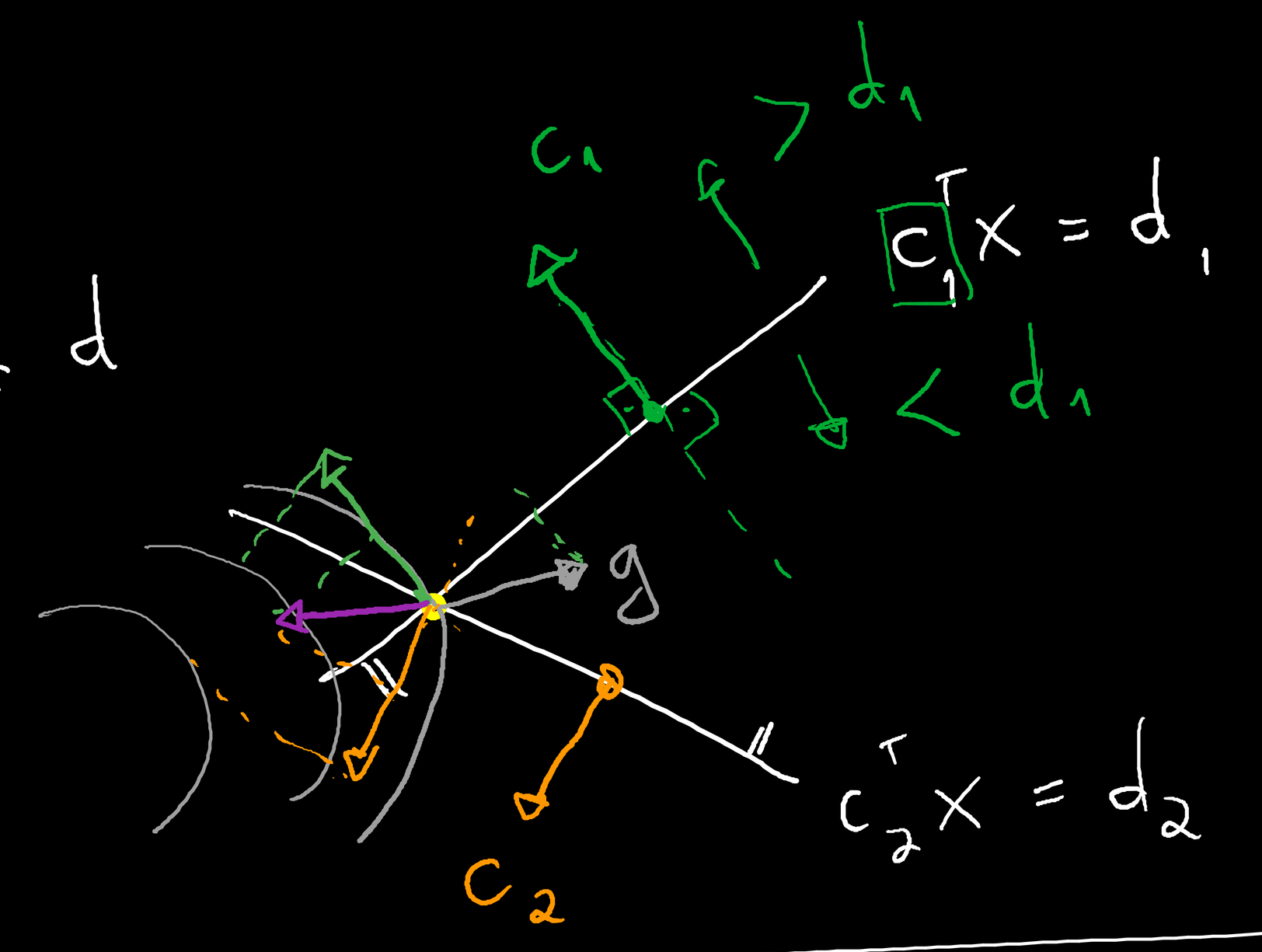
$\nabla f(x^*) + A^T y + C_{\mathcal{A}}^T z_{\mathcal{A}} = 0$

$z \in \mathbb{R}^p : z_i = 0$ se $i \notin \mathcal{A}^*$

Cond. de 1ª ordem: Se $x^* \in \Omega$ é min. local de $f \in C^1$ suj. a $Ax = b$ e $Cx \le d$, então $\exists\, y^*$ e z^* tais que

$$\nabla f(x^*) + A^T y^* + C^T z^* = 0$$
$$Ax^* = b$$
$$Cx^* \le d$$
$$(c_i^T x - d_i) \cdot z_i = 0$$
$$z \ge 0$$

$c^T x \le d$



$c_1 = \nabla_x (c_1^T x - d_1)$

C.O: $g + [c_1 \; c_2]^T z = 0$

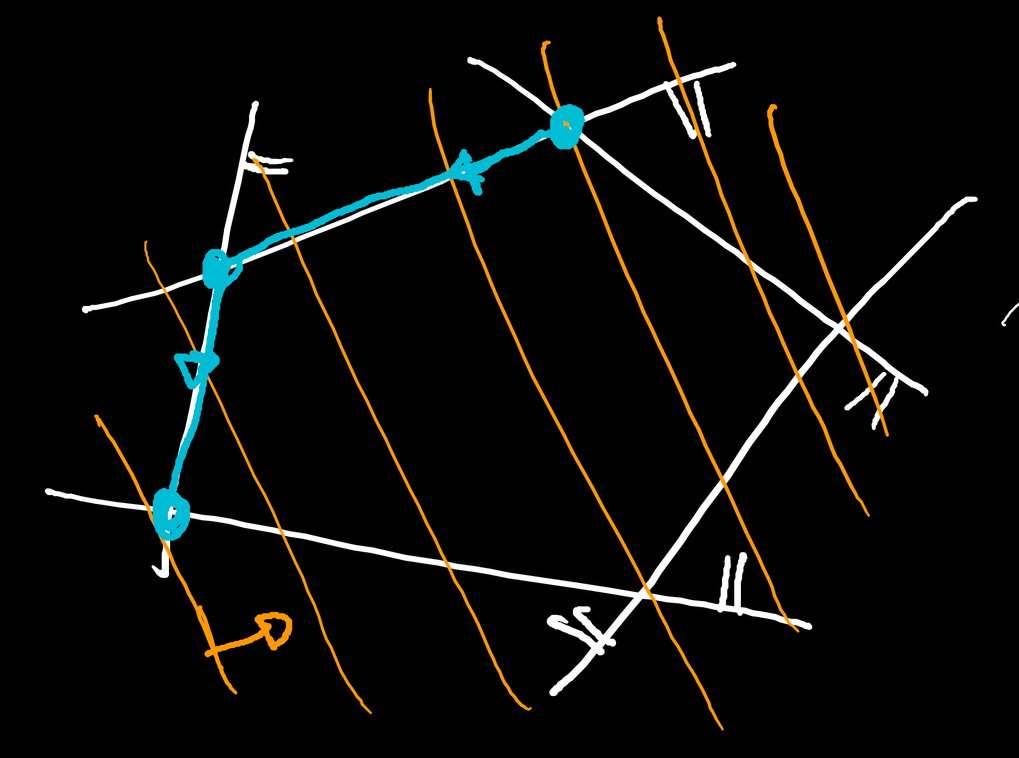
$g + z_1 c_1 + z_2 c_2 = 0$

$z_1, z_2 \ge 0$ $\quad = -g$

Ex.: $\quad Cx \le d_U, \; Cx \ge d_L \;\rightsquigarrow\; Cx \le d_U, \; -Cx \le -d_L$

Prog. Linear

$\min c^T x$ ($f(x)$ linear) $\to Ax = b, \; x \ge 0$; $\to Ax \le b$ $\quad s = b - Ax$, $Ax + s = b$, $s \ge 0$



$\rightsquigarrow [\;\;]_{5\times 2} \cdot x \le b$

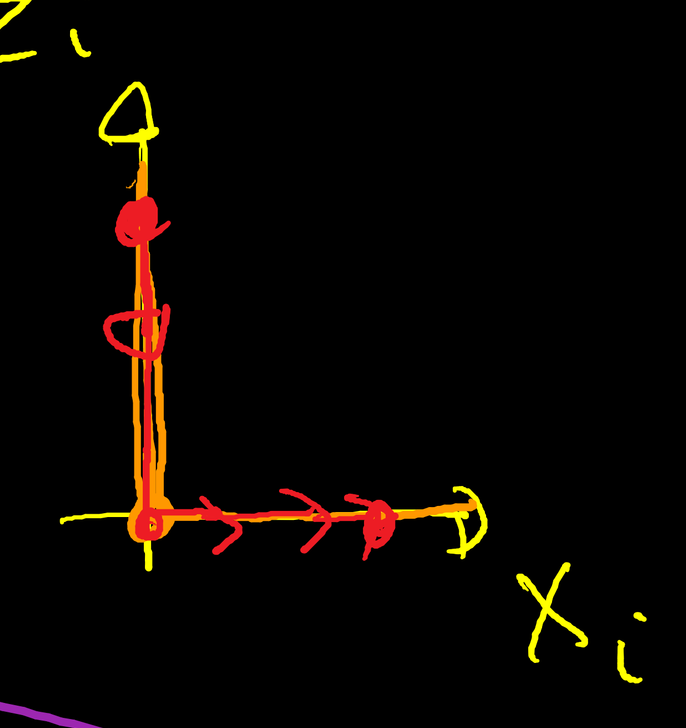
$\min c^T x$ s.a $Ax = b, \; x \ge 0$

$$\begin{cases} c + A^T y - z = 0 \\ Ax = b \\ x_i \cdot z_i = 0 \\ x, z \ge 0 \end{cases}$$ C.O. de PL

Método de Pontos Interiores

$\min \frac{1}{2} x^T Q x + c^T x$ s.a $Ax = b$ e $x \ge 0$

C.O.: $$\begin{cases} Qx + c + A^T y - z = 0 \\ Ax = b \\ Xz = 0 \\ x, z \ge 0 \end{cases}$$



$\min \frac{1}{2} x^T Q x + c^T x - \mu \cdot \sum_i \ln x_i$ s.a $Ax = b$

$$\begin{cases} Qx + c - \mu X^{-1} e + A^T y = 0 \\ Ax = b \end{cases}$$

$(x > 0)$

$\begin{bmatrix} 1/x_1 & & \\ & \ddots & \end{bmatrix} \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix}$

$z = \mu X^{-1} e$

$Xz = \mu e$

$x_i z_i = \mu$

$Xz = \mu e$

$F(x, y) =$

$$\begin{bmatrix} Q + \mu X_k^{-2} & A^T \\ A & 0 \end{bmatrix} \begin{bmatrix} \Delta x_k \\ \Delta y_k \end{bmatrix} = - \begin{bmatrix} Qx_k + c - \mu X_k^{-1} e + A^T y_k \\ Ax_k - b \end{bmatrix}$$

Hip.: $x_k > 0$

$x_{k+1} = x_k + \alpha_k \Delta x_k$

α_k t.q. $x_{k+1} > 0$ (e busca linear talvez)

$\mu_0 > 0 \; ; \; \mu_{k+1} < \mu_k$