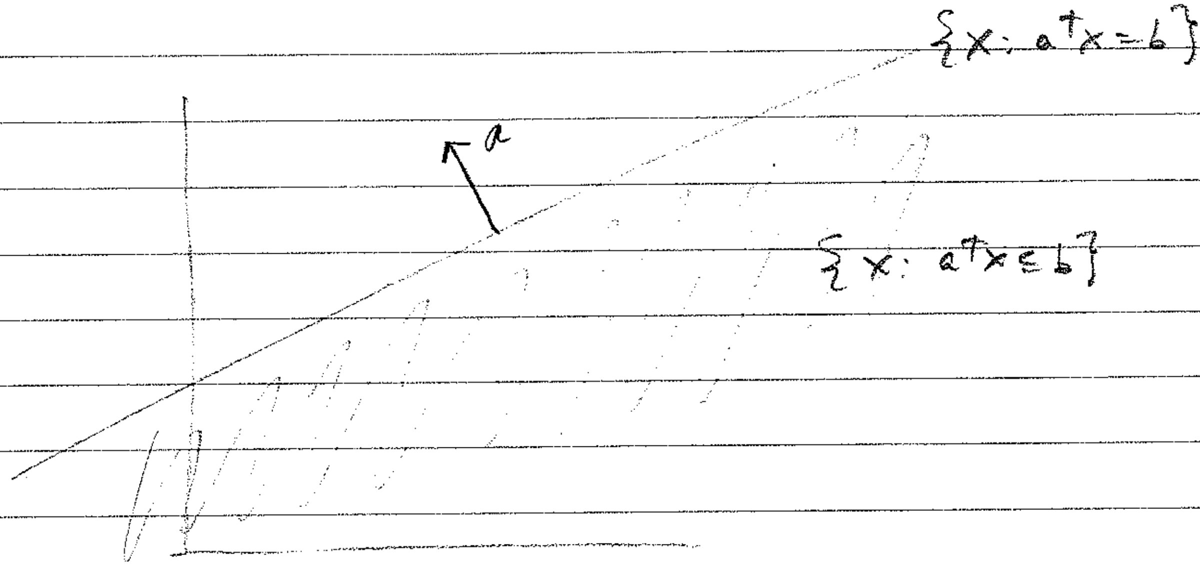
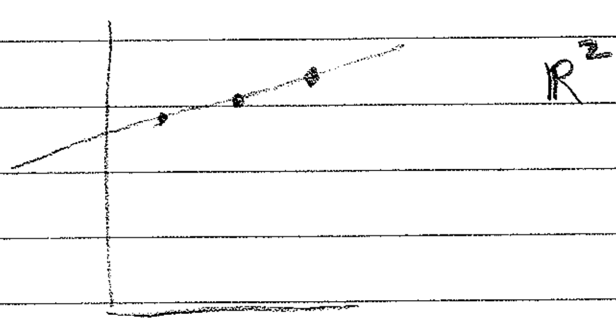
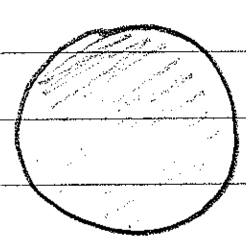
$$\mathrm{conv}(C) = \{ \theta_1 x_1 + \dots \theta_k x_k : k \in \{1,2,3,\dots\}, \; \theta_i \geq 0, \; \Sigma \theta_i = 1, \; x_i \in C \}$$



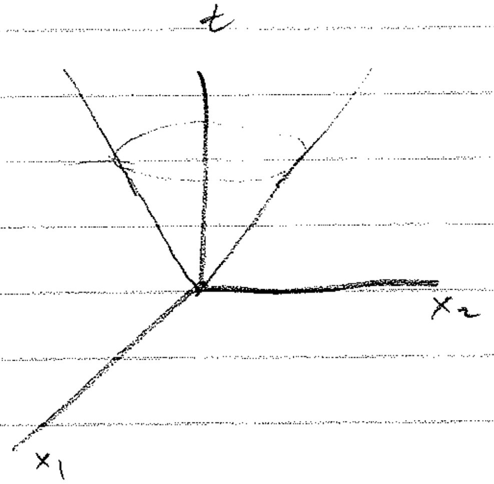
$x_0, \dots x_k$ aff. independent

$\iff$ $x_1 - x_0, x_2 - x_0 \dots x_k - x_0$ are lin. independent

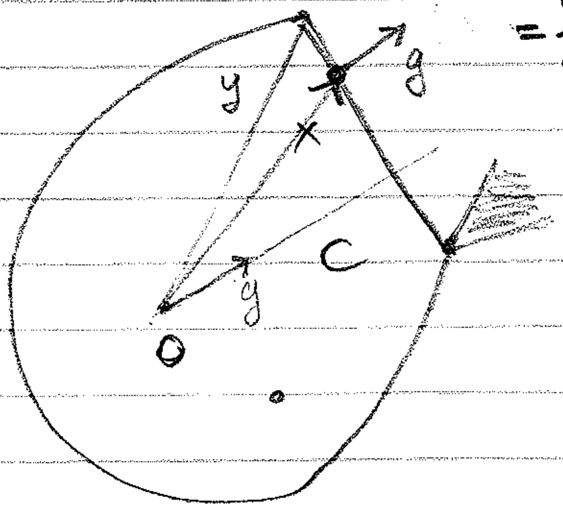




conic(C)



$\{(x,t) : \|x\|_2 \le t\}$



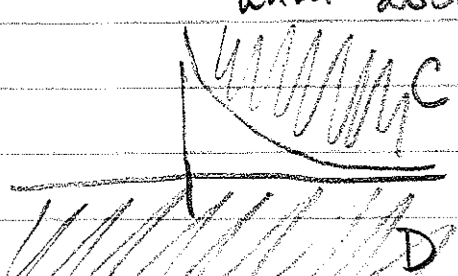
$$\mathcal{N}_C(x) = \{ g : g^T x = \max_{y \in C} g^T y \}$$

$$X \succeq 0 \iff a^T X a \ge 0 \text{ for any } a$$

---

convex C, D nonempty, $C \cap D = \emptyset$

what about $C \subseteq \{x : a^T x < b\}$?
$D \subseteq \{x : a^T x > b\}$



not always possible

$A_1, \dots A_k, \; B \in S^n$

$$\{x : \underbrace{x_1 A_1 + \dots x_k A_k} \preceq B\}$$

$$= \{x : B - (x_1 A_1 + \dots x_k A_k) \succeq 0\}$$

1. x, y

$tx + (1-t)y$

$$B - \sum_{i=1}^{k} (t x_i + (1-t) y_i) A_i \succeq 0$$

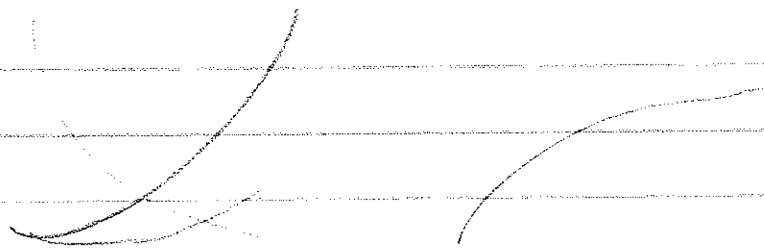
$$v^T \left(\underset{\overset{\|}{\cancel{tB + (1-t)B}}}{B} - \Sigma (t x_i + (1-t) y_i) A_i \right) v \geq 0 \quad \text{all } v$$

$$= t \cdot \underbrace{v^T (B - \Sigma x_i A_i) v}_{\geq 0} + (1-t) \underbrace{v^T (B - \Sigma y_i A_i) v}_{\geq 0} \geq 0.$$

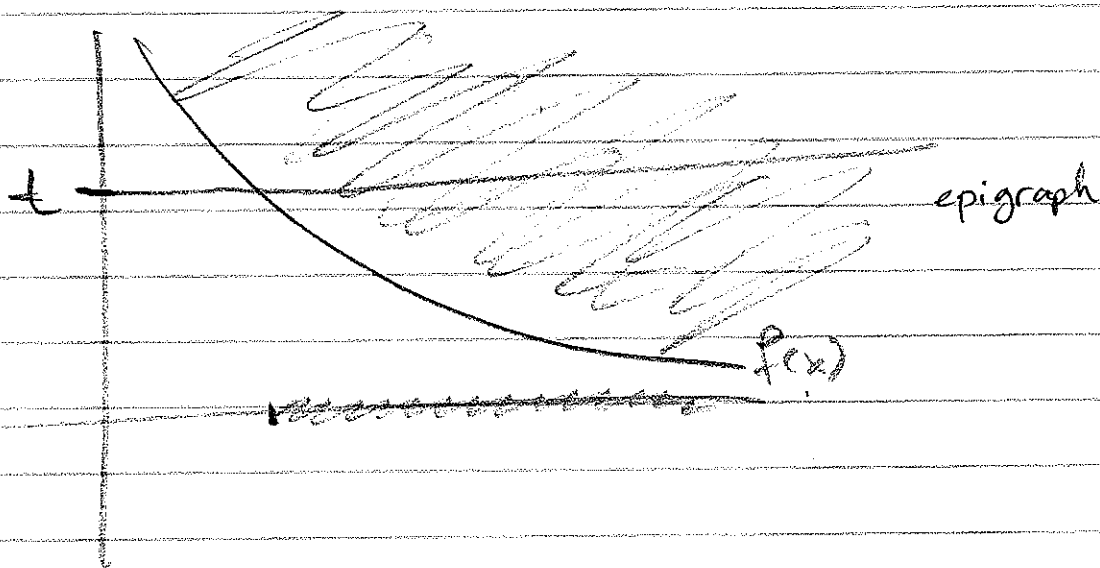
$$F_k = \{ Z \in S^n : 0 \preceq Z \preceq I, \; tr(Z) = k \}$$

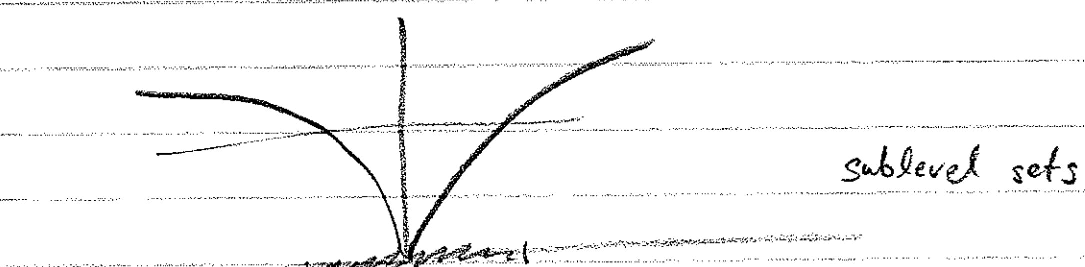
$$= \{ Z \in S^n : 0 \leq \lambda_1(Z) \leq \dots \lambda_n(Z) \leq 1, \; \Sigma \lambda_i(Z) = k \}$$

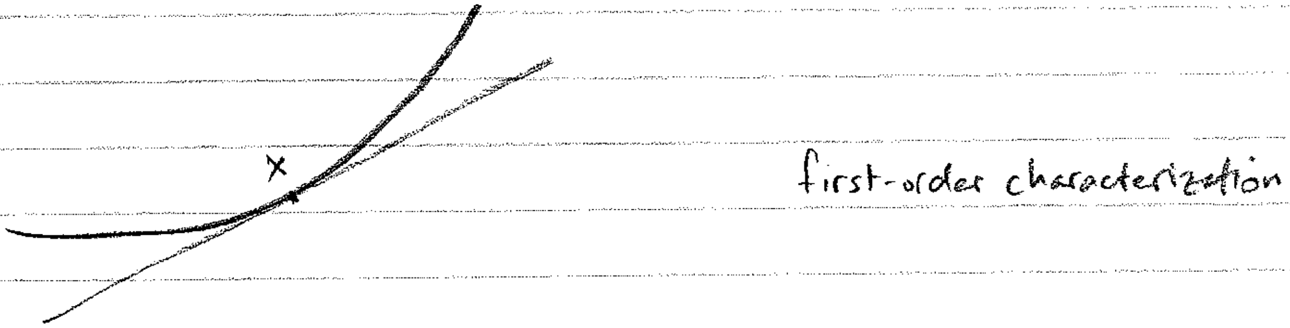
$$= \{ Z \succeq 0 \} \cap \{ Z \preceq I \} \cap \{ tr(Z) = k \}$$



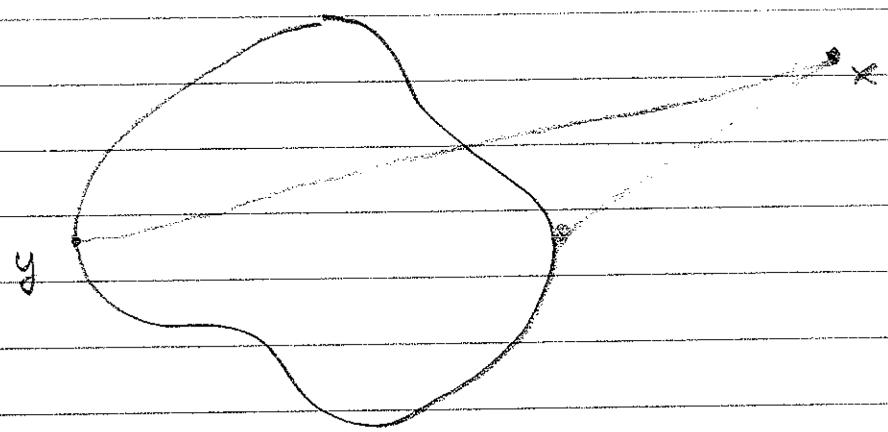
$$\|y - Ax\|_2^2 = x^T \underbrace{A^T A} x - 2y^T Ax + \text{con}$$







C 11·11



$$f(x) = h(g(x))$$