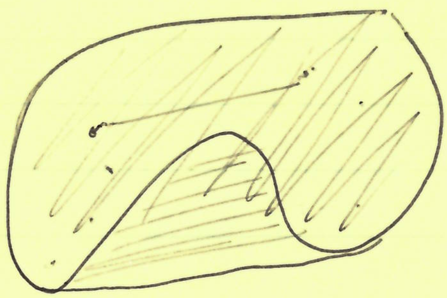


vectors x, y

$x \leq y$ means $x_i \leq y_i$ for all i

$\{x : Ax \leq b\} = \{x : a_i^T x \leq b_i \text{ all } i\}$

a_i: i^{th} row of A

$Cx = d$. $Cx \leq d$

$Cx \geq d \iff -Cx \leq -d$

$x_1, \dots x_k$ linearly ind:

means $a_1 x_1 + \dots a_k x_k = 0$

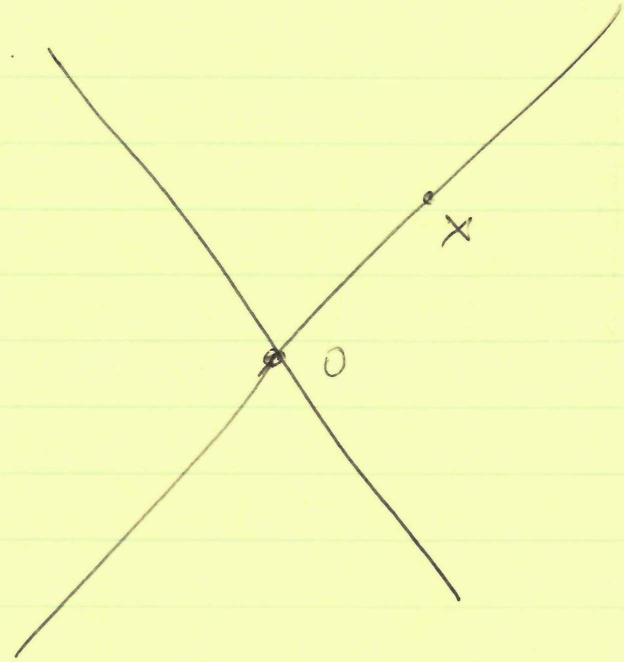
$\Rightarrow a_1 = \dots a_k = 0$

$x_0, x_1, \dots x_k$ affinely ind:

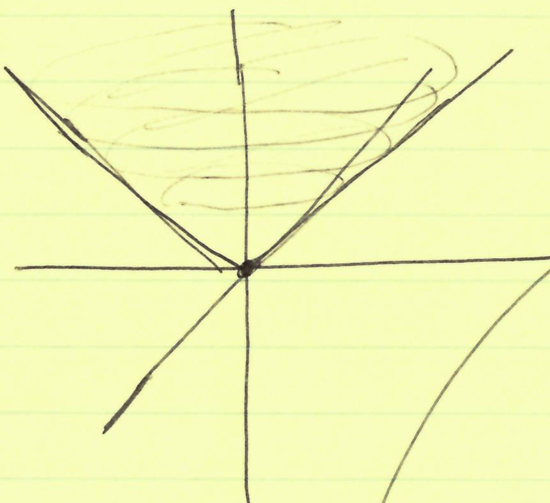
means $x_1 - x_0, \dots x_k - x_0$

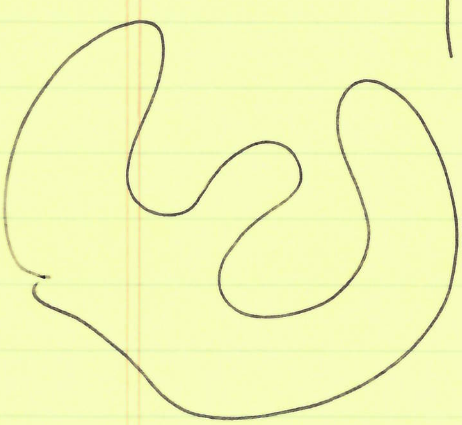
are linearly ind.

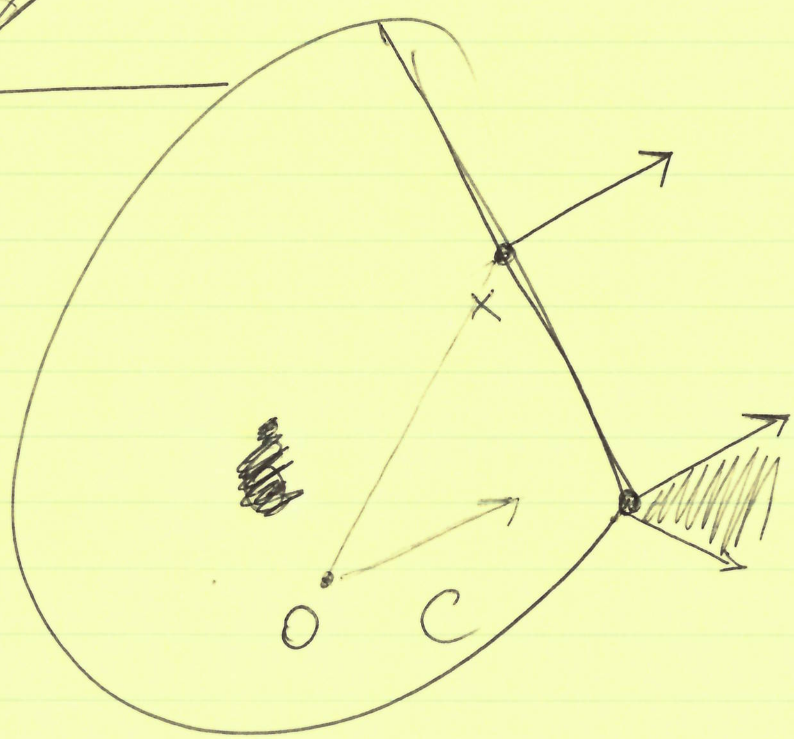
2.



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







$$N_C(x) = \{ g : g^T x \geq g^T y \text{ all } y \in C \}$$

$g_1 \in N_C(x)$, $g_2 \in N_C(x)$

$t_1 g_1 + t_2 g_2 \in N_C(x)$? all $t_1, t_2 \geq 0$.

$(t_1 g_1 + t_2 g_2)^T x$

$= t_1 g_1^T x + t_2 g_2^T x$

know that $g_1^T x \geq g_1^T y$ all y

$g_2^T x \geq g_2^T y$ all y

$\geq t_1 g_1^T y + t_2 g_2^T y$ all y

$= (t_1 g_1 + t_2 g_2)^T y$

$X \succeq 0$ means that $(X \in S^n)$

all eigenvals of X are ≥ 0

i.e.

$a^T X a \geq 0$ all $a \in \mathbb{R}^n$

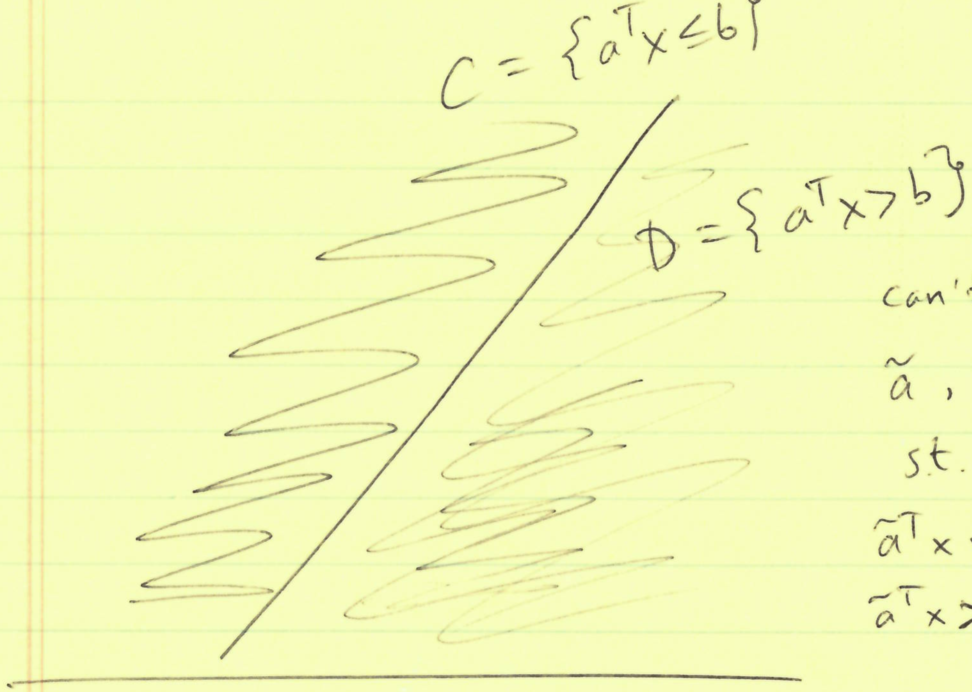
$X, Y \in S_+^n$

$t_1 X + t_2 Y \in S_+^n$? all $t_1, t_2 \geq 0$

$a^T (t_1 X + t_2 Y) a = t_1 a^T X a + t_2 a^T Y a$

≥ 0 all $a \in \mathbb{R}^n$

4.



can't

$\tilde{a}, \tilde{b}$

s.t.

$\tilde{a}^T x < \tilde{b}$ on C

$\tilde{a}^T x > \tilde{b}$ on D

$x_1 A_1 + \cdots x_k A_k \preceq B$ means

$B - (x_1 A_1 + \cdots x_k A_k) \succeq 0$

$X \preceq Y$ means $Y - X \succeq 0$.

$$\left\{ x : \sum_{i=1}^{k} x_i A_i \preceq B \right\}$$

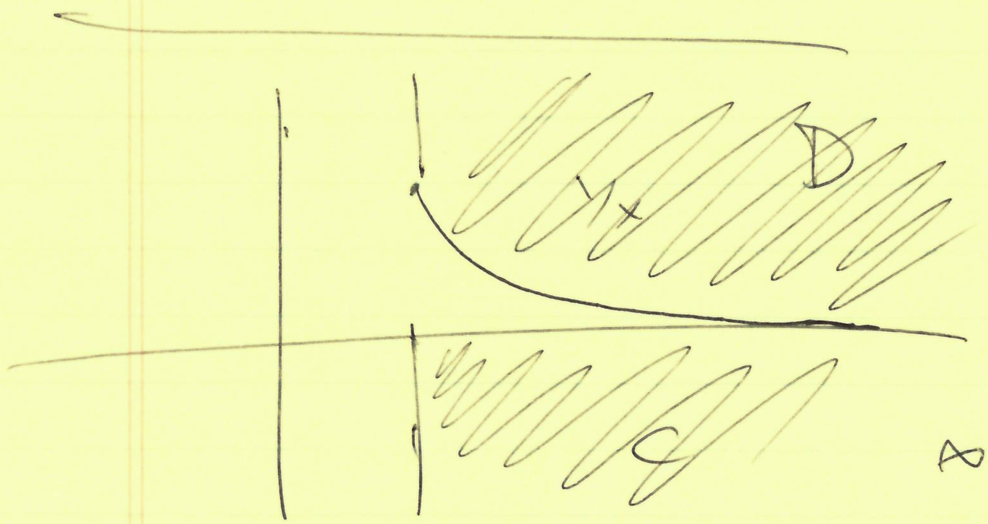
convex!

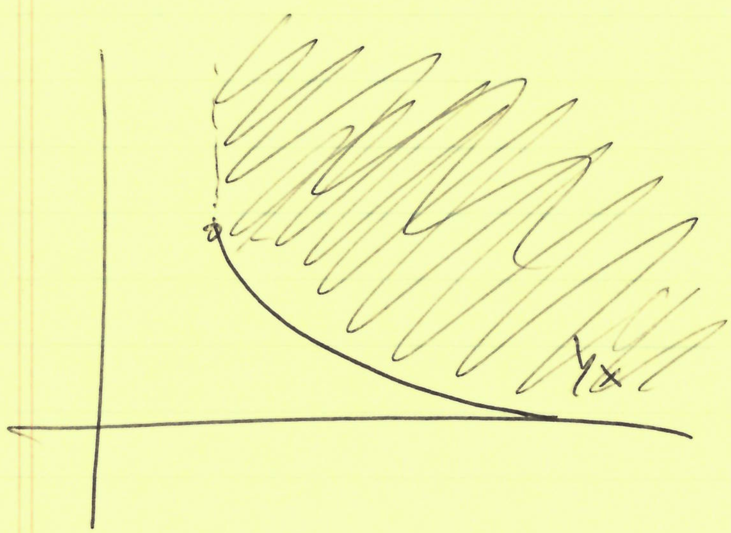
$$= \{ x : f(x) \succeq 0 \}$$

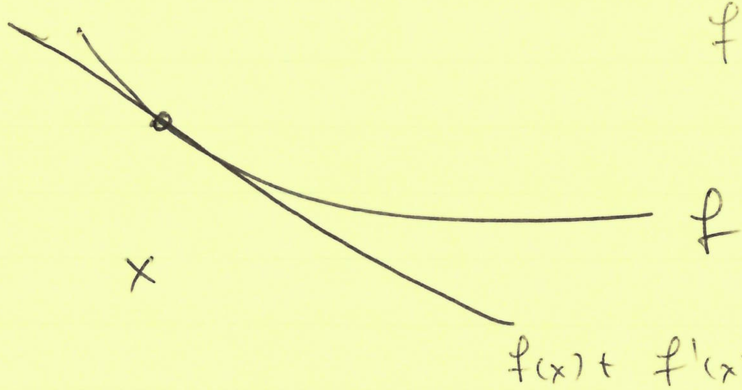
$$= f^{-1}(S_+^n)$$

m- strongly convex f means
g is convex. where

$$g(x) = f(x) - \frac{m}{2}\|x\|_2^2$$



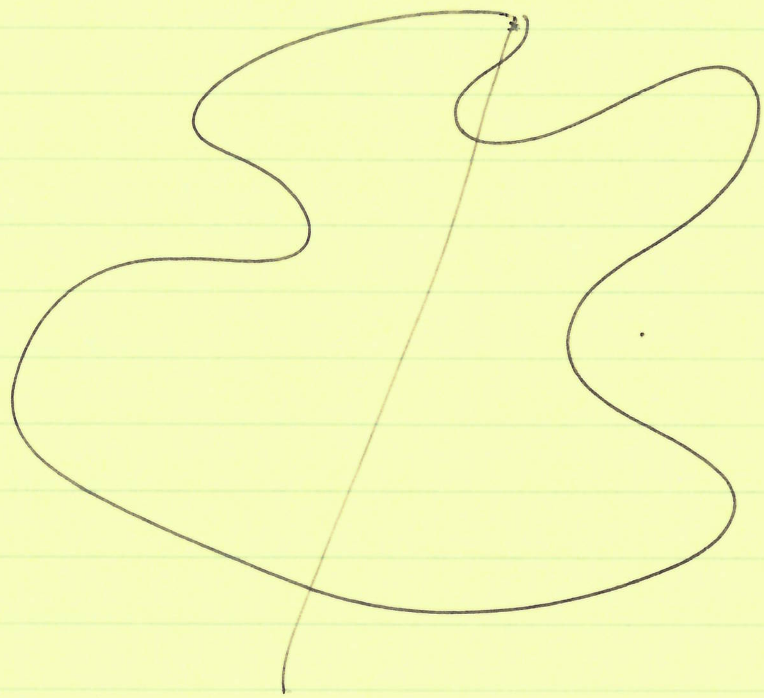




$f''(x) \geq 0$
all x

$$[\nabla^2 f(x)]_{ij} = \frac{\partial^2 f(x)}{\partial x_i \partial x_j}$$

6



$$f(x) = \max_{y \in C} \|y - x\|$$