

Exercises Nr.1:

15-09-2011

Ex.1.6 Given the quadratic function on \mathbb{R}^n ,

$$f(x) = x^T Qx + c^T x + d,$$

with symmetric matrix Q , $c \in \mathbb{R}^n$, $d \in \mathbb{R}$. Show (by only using the def. of convexity) that f is convex iff Q is psd.

Ex. 1.15' Show that for $S \subset \mathbb{R}^n$ the set $\text{aff}(S)$ is the smallest affine space containing S .

Recall that the affine hull of the set S is defined by:

$$\text{aff}(S) = \left\{ x \mid x = \sum_{i=1}^k \lambda_i x^i, x^i \in S, \lambda_i \in \mathbb{R}, \sum_{i=1}^k \lambda_i = 1, k \geq 1 \right\}$$

Ex. 1.16' Let $C \subset \mathbb{R}$ be convex and compact. Show that C must be a closed interval, $C = [a, b]$ for some $a \leq b$.