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8. Analysis

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Quasi-interior points for convex sets

For a convex set Q in a topological linear space E space we put

$$Q^\star = \{\xi : E \to R : \xi \text{ is linear, continuous and } \inf \xi(Q) < \sup \xi(Q)\}.$$

If $IntQ \neq \emptyset$ then $Q^\star = E^* \setminus \{0\}$ (where E^* denotes the dual of E).
A point $q_o \in Q$ is a *support point* of Q if there exists $\xi \in Q^\star$ such that $\xi(q_o) = \sup \xi(Q)$ and we say that ξ supports Q at q_o. An element of Q which is not a support point is called a *quasi-interior point* of Q. Note that some authors defined support points of Q considering all elements of $E^\star \setminus \{0\}$ instead of $Q^\star$. In this case the set of support points can be bigger, but the notion is less subtle. The notion of quasi-interior pionts is a nice tool in the investigation of the properties of the positive cones and positive part of the ball of Banach Lattices or spaces with similar structure (i. e. the set of positive operators acting on Hilbert space).