1 Answer to question what is an ordered group

An Left ordered group is a group G endowed with a total ordering $\leq$ such that for all $a, b, c \in G$, if $a \leq b$ then $ca \leq cb$.

A Right ordered group is similar except we conclude $ac \leq bc$.

An ordered group is a group which is both left ordered and right ordered.

2 What I am trying to accomplish for tvs that is known for today

Currently there are many fixed point theroems for operators $T : A \subset X \to 2^X$ where X is some Banach space whose proofs rely on various convexity assumptions imposed on the unit sphere of X (or equivalently assumptions on the differentiability of X's normalized duality mapping). In this category I lump results that rely on reflexivity, strict convexity, local uniform convexity, and uniform convexity

I aim to extend some of these results, or to prove that extensions in general do not exist, or **require** additional assumptions for locally convex topological spaces using the following approach:

1. All Locally convex TVS's are generated by a collection of seminorms, so the first order of business is to extend many of the useful, but not directly fixed point, results regarding convexity of spaces (or differentiability of seminorms). Some of these results (Banach Alaoglu for one) are already known for localy convex topological vector spaces and Seminormed spaces. Many of them are not, or at least are not written down. It is not intuitive that many of these results are extendable until one realizes that the topological dual space of a seminormed space is a Banach space, so many of the old arguements can be applied, with minor modifications. Hence there is a natural, if involved mechanism for translating many of these results.

2. Once the big name theorems regarding convexity of unit balls and differentiability of seminorms have been verified, I will then look into conditions under which sets of fixed points "modulo" a seminorm on a tvs can be guaranteed to have nonempty intersection. My current thoughts inthis direction are that some uniformed boundedness type condition may need to be placed on the operator to allow weak* compactness and the finite intersection property to be exploited.

3. Using the results from (1) an d(2), I then will review as many fixed point results as I can and try to exploint cases where extensions are possible, and ideally come up with a characterization for cases where the extension is possible.