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Fachbereich Mathematik und Statistik
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TOPOLOGICAL VECTOR SPACES II–WS 2019/20
Recap Sheet 3

*This recap sheet aims to self-assess your progress and to recap some of the definitions and concepts introduced in the previous lectures. You do **not** need to hand in solutions, but please try to answer as many questions as you can since this is a very good training in preparation of your final exam. If you should have any problem, please do not hesitate to attend Maria's office hours on Thursdays 11:45–13:15 in room F408.*

1) Recall the definition of accumulation point of a filter of a topological space. What is the relation between accumulation points and limit points of a filter of a t.v.s.?

2) Recall the definition of projective topology on a vector space. List at least two examples of projective topologies.

3) Give a criterion for a projective topology to be Hausdorff. Use this criterion to reprove the fact, that the product of Hausdorff spaces is itself a Hausdorff space.

4) Compare the concepts of inductive and projective topology.

5) Do you know a vector space which can be equipped with both an inductive and a projective topology? What are the defining sequences?

6) Recall the definition of projective limit and convince yourself that any product of l.c. t.v.s. can be realized as a projective limit.

7) Do you know a property that is satisfied by any projective limit?

8) Give a sufficient condition for a continuous linear map between two t.v.s. to be open.

9) State the closed graph theorem and sketch how to deduce it from the open mapping theorem.

10) Are the closed graph and the open mapping theorem equivalent? Justify or answer with a sketch of a proof or a counterexample!