## MAT 531

Geometry/Topology II

# Introduction to Smooth Manifolds 

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Infinite-dimensional vector space

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Good generalization for vector fields that are $C^{k}$.

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This makes $\mathfrak{X}(M)$ into a "Lie algebra."

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This map is called the flow of $V$.

Theorem.

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Notice that

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\Phi_{-t}=\left(\Phi_{t}\right)^{-1}
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Corollary. Let $M$ be a connected n-manifold, and let $p_{1}, \ldots, p_{k} \in M$ be any $k$ points. Then there is a coordinate domain $U \subset M, U \approx \mathbb{R}^{n}$, such that $p_{1}, \ldots, p_{k} \in U$.

When $k=2$, take $U$ to be coordinate domain $\ni p_{1}$.

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General $k$ similar; proceed by induction.

