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## Exponential map from lie algebra of a lie group

**Definition.** Exponential map from lie algebra of a lie group

We already have an [exponential of vector fields](#) just use that! The **exponential map** from [Lie algebra](#) of  $G$  to the group

$$\begin{aligned} \exp : \operatorname{Lie}(G) &\rightarrow G \\ X &\mapsto (\exp X)(i_G) \end{aligned}$$

where, here, we use the identification of  $\operatorname{Lie}(G)$  with  $\operatorname{leftVec}(M)$ .

Hence, the first lie algebra we exponentiate, here, is of [the vector fields](#).

### exponential and Lie brackets

**Proposition:**

$$\exp[X, Y] = [\exp X, \exp Y]$$

### exponential and adjoint

• 
$$\exp(\operatorname{Ad}_x Y) = \mathfrak{c}_x(\exp Y)$$

[1]

• 
$$\exp(\operatorname{ad}_X) = \operatorname{Ad}_{\exp(X)}$$

[2]

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