

## Maybe Exercises 2

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- ① Prove that  $\text{clone}_D$  is a category.
- ② Prove that colimits in  $\mathcal{C}$  are limits in  $\mathcal{C}^{\text{op}}$ .
- ③ The following facts follow from ② and the corresponding facts about limits. You could prove them directly just for fun.
  - colimits are unique up to unique isomorphism.
  - there is a category  $\text{cocone}_D$  of cocones over a diagram  $D$ .
  - the colimit of  $D$  is the initial object of  $\text{cocone}_D$ .
- ④ Prove that if  $\mathcal{D}$  has all the limits of shape  $\mathcal{J}$ , then  $[\mathcal{C}, \mathcal{D}]$  has all limits of shape  $\mathcal{J}$ .