# Exercise sheet 6.

Name

| Exercise | 1 | 2 | 3 | 4 | 5 | $\Sigma$ |
|----------|---|---|---|---|---|----------|
| Points   |   |   |   |   |   |          |

Exercise group (tutor's name)

Deadline: **Friday, 3.12.2021, 16:00**.

Please use this page as a cover sheet and enter your name and tutor in the appropriate fields. Please staple your solutions to this cover sheet.

The following exercises are from Section 3.1 of Emily Riehl's book *Categories in context*.

**Exercise 1.** For a fixed diagram $F \in \mathcal{C}^J$, describe the action of the cone functors $\mathrm{Cone}(-, F) \colon \mathcal{C}^{\mathrm{op}} \to \mathfrak{Sets}$ and $\mathrm{Cone}(F, -) \colon \mathcal{C} \to \mathfrak{Sets}$ on morphisms in $\mathcal{C}$.

**Exercise 2.** Prove that the category of cones over $F \in \mathcal{C}^J$ is isomorphic to the comma category $\triangle \downarrow F$ formed from the constant functor $\triangle \colon \mathcal{C} \to \mathcal{C}^J$ and the functor $F \colon \mathbb{1} \to \mathcal{C}^J$. Argue by duality that the category of cones under $F$ is the comma category $F \downarrow \triangle$.

**Exercise 3.** What is the coproduct in the category of commutative rings?

**Exercise 4.** Let $\mathcal{C}$ be the category of a poset $(X, \leq)$. Relate limits and colimits of diagrams in $(X, \leq)$ to infima and suprema.