

# Metric Geometry

## Exercise Sheet 3

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You can find information about the exercise class on our homepage. If you have problems with some of the exercises or search for further exercises, the script (especially Appendix A) might be helpful.

### Exercise 1

Show that injective spaces are complete, geodesic and contractible.

### Exercise 2

Let  $\mathbb{S}^1 \subset \mathbb{R}^2$  be equipped with its induced length metric and  $r: \mathbb{S}^1 \rightarrow \mathbb{R}$ . Show that  $r$  is extremal if and only if  $r$  is 1-lipschitz and  $r(x) + r(-x) = \pi$  for all  $x \in \mathbb{S}^1$ .

### Exercise 3

Let  $X$  be a metric space with  $|X| \in \{2, 3\}$  and discrete metric. Describe the space of extremal functions on  $X$  (see p.36 for the definition).

### Exercise 4

Show that Urysohn spaces are finitely hyperconvex (see 3.12. for the definition).