LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN
MATHEMATISCHES INSTITUT

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Geometric Group Theory

Sheet 11

Exercise 1. Let X be a geodesic metric space and let $Y \subset X$ be a subspace that is geodesic with respect to the subspace metric. We write $i : Y \to X$ for the inclusion map.

a) Does the map i always induce an injection $\mathrm{Ends}(Y) \to \mathrm{Ends}(X)$?

b) Does the map i always induce an surjection $\mathrm{Ends}(Y) \to \mathrm{Ends}(X)$?

Exercise 2.

a) Does the Heisenberg group have infinitely many ends?

b) Does every group of exponential growth have infinitely many ends?

Exercise 3. Use ends to prove that the free group of rank 2 is not quasi-isometric to the hyperbolic plane $\mathbb{H}^2$.

Exercise 4. Let G and H be groups of infinite order. Prove that $G \times H$ has one end.

You can hand in your solutions during the exercise classes.