MA 314 Homework 9: "Orthogonal Circles" would be a great name for a band.

This homework is intended to be lighter than usual.

1. Reading

Read the following sections on hyperbolic geometry:

- Bonahon: Section 2.5 - 2.7 (In section 2.6, just pay attention to the notation for now.)
- Schwartz: Sections 10.4 and 10.7
- Watch the video on Möbius transformations by Douglas Arnold and Jonathan Rogness.

2. Mortar

- In class we sketched a proof of Lemma 2.8 (Bonahon) and how it can be used to show that every isometry of $\mathbb{H}^2$ is a linear fractional transform or anti-linear fractional transform. Write out the whole proof, filling in all the details (especially those omitted by Bonahon). Conclude by describing how this result is used to show that every isometry of $\mathbb{H}^2$ is the composition of basic isometries.
- Do Exercise 2.9 of Bonahon on page 41. (Hint: Use the result proved in class that a hyperbolic isometry which fixes 3 points not on a geodesic is the identity, but remember that 0 and ∞ are not elements of $\mathbb{H}^2$.)