

Math 130
Homework 8 – Due November 8, 2016
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1. Read Stillwell 7.9, 8.1–8.4.
2. Just for fun: play Hypernom: a game in 4-dimensional space <http://hypernom.com/>.
3. Do the following problems from Stillwell: 8.1.1 – 8.1.4, 8.2.6, 8.3.1 – 8.3.4
4. When we study the upper-half plane \mathbb{H}^2 , we focus on fractional linear transformations of the form $\frac{az+b}{cz+d}$ with $a, b, c, d \in \mathbb{R}$. In the more general case where $a, b, c, d \in \mathbb{C}$, we still get transformations of the complex plane (or more accurately, the complex projective line $\mathbb{C}P^1$), and they still correspond to reflections, rotations, translations, and inversions. Watch this video that illustrates them: <https://www.youtube.com/watch?v=JX3VmDgiFnY>.

Can you describe two examples of a motion of the sphere (as in the video) that correspond to Möbius transformations that preserve the real axis (*ie.* ones that preserve the upper-half plane)? Explain your answer briefly.

5. (optional) Explore this java applet on Möbius transformations: <https://www.math.ucla.edu/~tao/java/Mobius.html> (by Terry Tao). There are suggested exercises at the bottom of the page.