In fact, even more is true. $LF(\mathbb{C})$ doesn't know the difference between lines and circles. (look at how $\mathbb{E}$ and $\mathbb{H}$ appear in $\mathbb{CP}^1$, if you don't believe me).

"Prop:" $LF(\mathbb{C})$ transforms $\{\text{lines, circles}\} \subseteq \mathbb{CP}^1$ into itself. (In fact, it acts transitively on them.)

Proof: We'll need some strategy to prove this (as I see it). I want to think about both of the complicated objects in the proposition.

First, $LF(\mathbb{C})$. I claim $LF(\mathbb{C})$ is generated (as a group) by translation ($\mathcal{T}_A(z) = z + A$), dilation ($\mathcal{D}_B(z) = Bz$, with $B \neq 0$) and the inversion $\mathcal{I}(z) = \frac{1}{z}$. How can we see this? Consider $M(z) = \frac{az+b}{cz+d}$. If $c = 0$, $M(z) = \frac{a}{d}z + \frac{b}{d} = \mathcal{T}_{\frac{b}{d}}\left(\mathcal{D}_{\frac{a}{d}}(z)\right)$.

If $c \neq 0$, consider $\frac{az+b}{cz+d} = \frac{\frac{a}{c}z + \frac{b}{c}}{z + \frac{d}{c}} = \frac{\frac{a}{c}\left(z+\frac{d}{c}\right) - \frac{ad}{c^2} + \frac{b}{c}}{z + \frac{d}{c}} =$