THE CHINESE UNIVERSITY OF HONG KONG
Department of Mathematics
MMAT 5120 Topics in Geometry 2023-24
Lecture 4 practice problems
29th September 2023

- The practice problems are meant as exercise to the students. You are **NOT** required to submit your solutions, but you are encouraged to work through all of them in order to understand the course materials. The problems will be uploaded on Fridays and solutions will be uploaded on Wednesdays before the next lecture.
- Please send an email to **zdmu@math.cuhk.edu.hk** if you have any questions.

1. Recall that given any Möbius transformation $T(z) = \frac{az+b}{cz+d}$, we can associate to it a matrix $A_T = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$. Given any two Möbius transformations T, S, verify that the matrix corresponding to $T \circ S$ is actually $A_T \cdot A_S$ given by matrix multiplication.
2. Let f be a Möbius transformation that fixes 0 and ∞, prove that f is of the form $f(z) = az$ for some nonzero complex number $a \in \mathbb{C} \setminus \{0\}$.
3. Determine the fix points of the following Möbius transformations.
   (a) $T(z) = \frac{z-i}{z+i}$.
   (b) $T(z) = 3iz$.
   (c) $T(z) = \frac{2iz+1}{2i+1}$.