1. Find the image of the unit circle under the mappings:
   (a) $f(z) = \frac{1}{z}$
   (b) $f(z) = \frac{1}{z-1}$
   (c) $f(z) = \frac{1}{z-2}$

2. Find the image of the lines $x = a$ and $y = b$ under the mapping $f(z) = e^z = e^{x+iy}$. $(a, b \in \mathbb{R})$

3. What is the image of the upper-half plane under a mapping of the form

$$f(z) = \frac{az+b}{cz+d}$$

   when a, b, c, d are all real numbers and $ad - bc > 0$?

4. Find the Möbius transformations that send
   (a) $1, i, -1$ to $-1, i, 1$, respectively
   (b) $-i, 0, i$ to $-0, i, 2i$, respectively
   (c) $-i, i, 2i$ to $\infty, 0, \frac{1}{3}$, respectively

5. Prove that a Möbius Transformation has at most two fixed points. ($z \in \mathbb{C}$ such that $f(z) = z$)