**Homework 4**

Due: Friday, 3/12/2004

1. Determine the Euclidean center and Euclidean radius of the image of the Euclidean circle A given by the equation $\alpha z\bar{z} + \beta z + \bar{\beta}\bar{z} + \gamma = 0$ under $f(z) = az + b$, $f(\infty) = \infty$, where $a, b \in \mathbb{C}, a \neq 0$.

2. Let A be Euclidean circle in $\mathbb{C}$ given by equation $|z - z_0| = r^2$. Determine conditions on $z_0$ and $r$ st $J(A)$ is a Euclidean line in $\mathbb{C}$.

3) Consider the unoredered triple $T = \{0, 1, \infty\}$ of points in $\mathbb{C}$. Determine all Möbius transformations $m$ satisfying $m(T) = T$.

4) Give an explicit Möbius transformation taking $D = \{z \in \mathbb{C} | |z| < 1\}$ to $\mathbb{H}$.

5) Normalize each of the following Möbius transformations and determine their types (elliptic, parabolic, loxodromic):

$$m(z) = \frac{-z - 3}{z + 1}$$

$$m(z) = \frac{iz + 1}{z + 3i}$$

$$m(z) = iz + 1$$