Homework 3

MATH 435 Geometry
Fall 2007

09/20/2007. Due on 09/27/2007

Instructions: Solve the following problems. Provide as much written detail as possible.

1. Let $f : \mathbb{R}^2 \to \mathbb{R}^2$ be the transformation

$$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} 2 \\ -1 \end{bmatrix}.$$

Find its inverse.

2. Let C denote the circle of radius 1 and with centre at the origin $(0, 0)$, and let f be the transformation in **1**. Describe what the set $f(C)$ is. Is f an Euclidean transformation? Why?

3. Let $C(r; (a, b))$ denote the circle of radius r and centre (a, b) in $\mathbb{R}^2$. Show that $C(r; (a, b))$ is related to $C(r_1; (a_1, b_1))$ via an Euclidean transformation if and only if $r_1 = r_2$.

4. Are *any* two ellipses related by an Euclidean transformation? Justify your answer.