Math 2270-1
Fri 2 Sept.

HW for Fri Sept 1
- Bob problems on today's notes

2.1 1, 3, 4, 5, 6, 7, 8, 10, 13, 16, 17, 19, 21, 24, 25, 27, 28, 30, 32, 36, 39, 42
2.2 1, 2, 7, 9, 10, 11, 12, 13, 17, 27, 35, 36, 37, 38, 43, 44, 49
2.3 1, 2, 5, 6
2.4 1, 4, 14

- Finish Wed. notes

- A generalization of "linear" (matrix) transformations allows you to translate by a fixed vector after performing the matrix product:

$$f(\vec{x}) = A\vec{x} + \vec{b}$$

Affine transformations are the backbone of single and multivariable Calculus, because every differentiable function is almost affine on small scales!

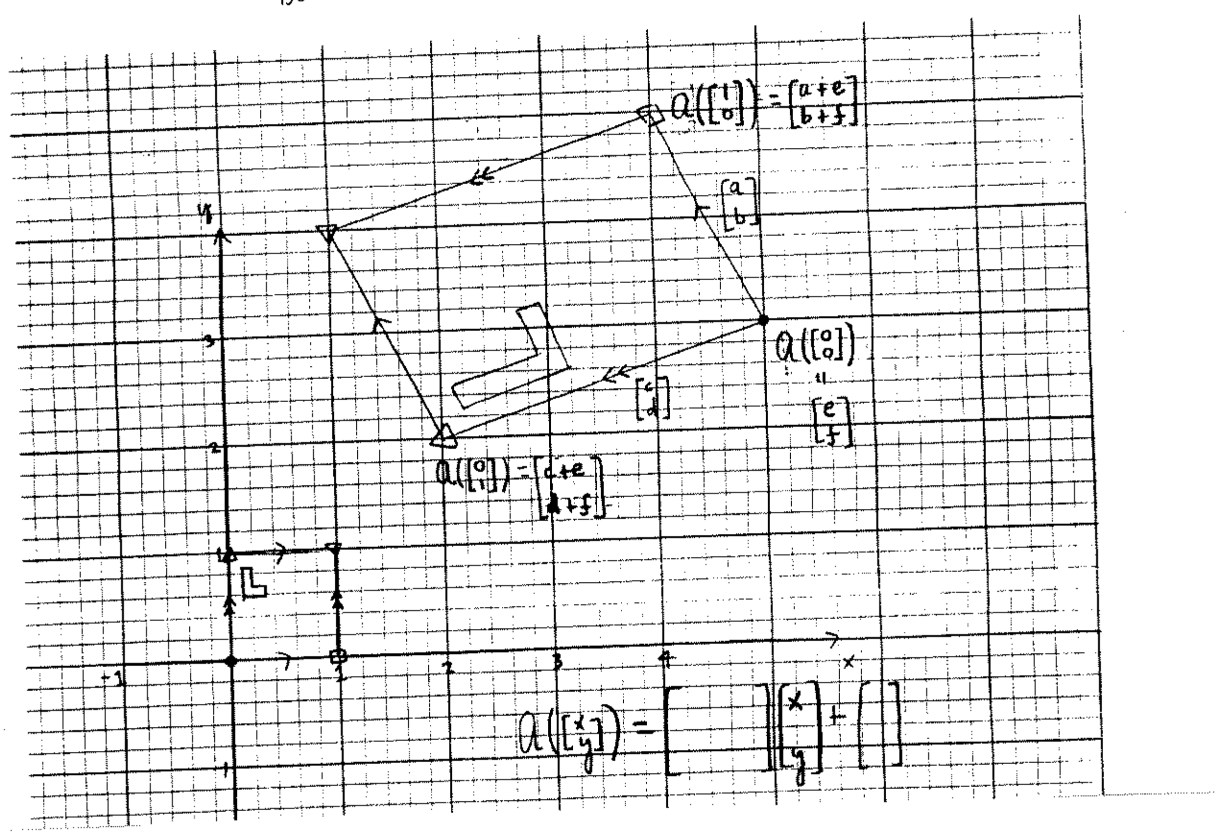
The properties of matrix transformations (p. 5 Wed) yield the same geometric properties for affine ones (e.g. parallel lines $\rightarrow$ parallel lines
midpoints $\rightarrow$ midpoints
scaled sets $\rightarrow$ scaled image sets.)

Affine transformation template

$$a\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} a & c \\ b & d \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} e \\ f \end{bmatrix} = \begin{bmatrix} ax + cy + e \\ bx + dy + f \end{bmatrix} = x\begin{bmatrix} a \\ b \end{bmatrix} + y\begin{bmatrix} c \\ d \end{bmatrix} + \begin{bmatrix} e \\ f \end{bmatrix}$$

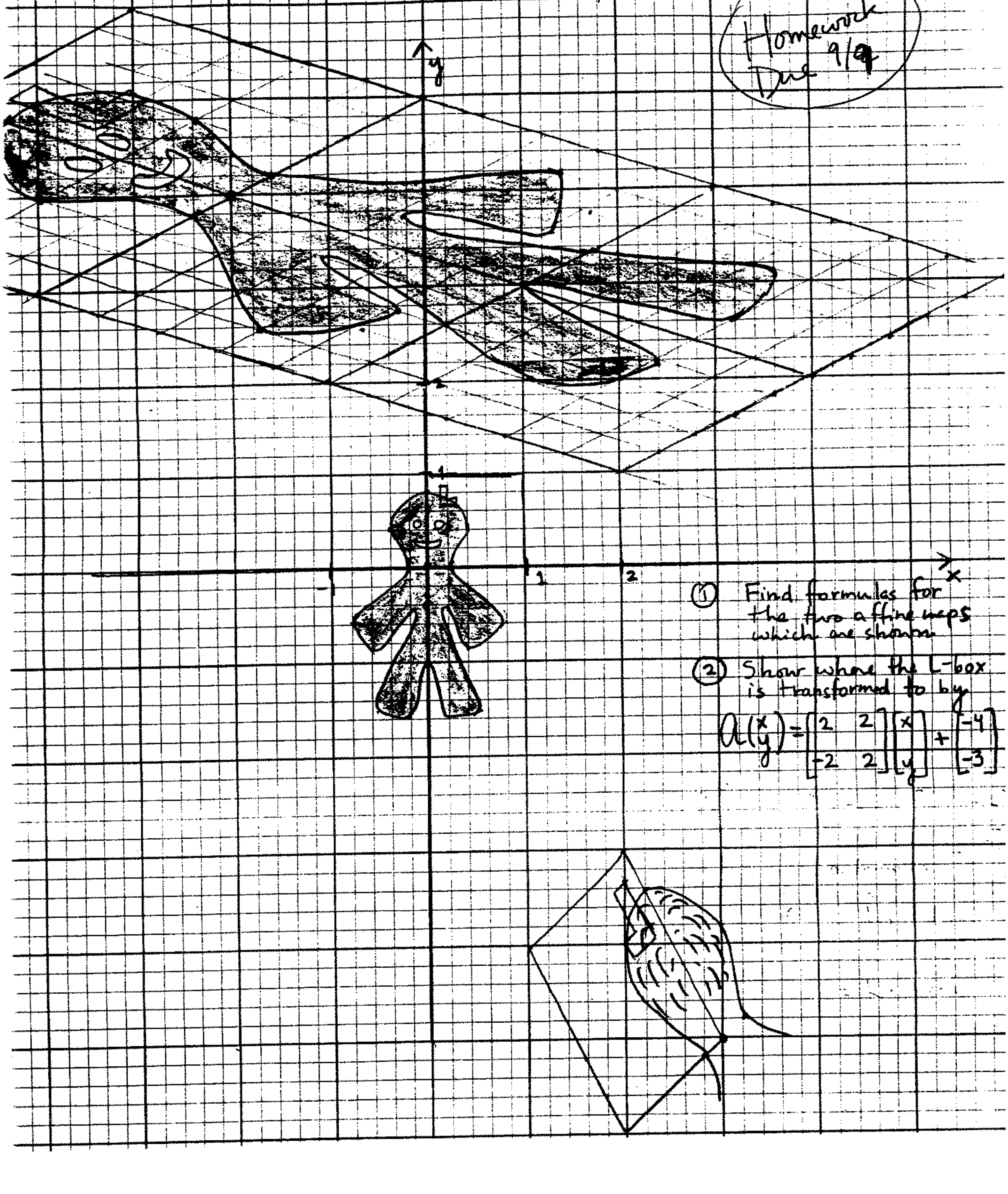
this part distorts Bob

this part translates him



Bob & L-box transform themselves

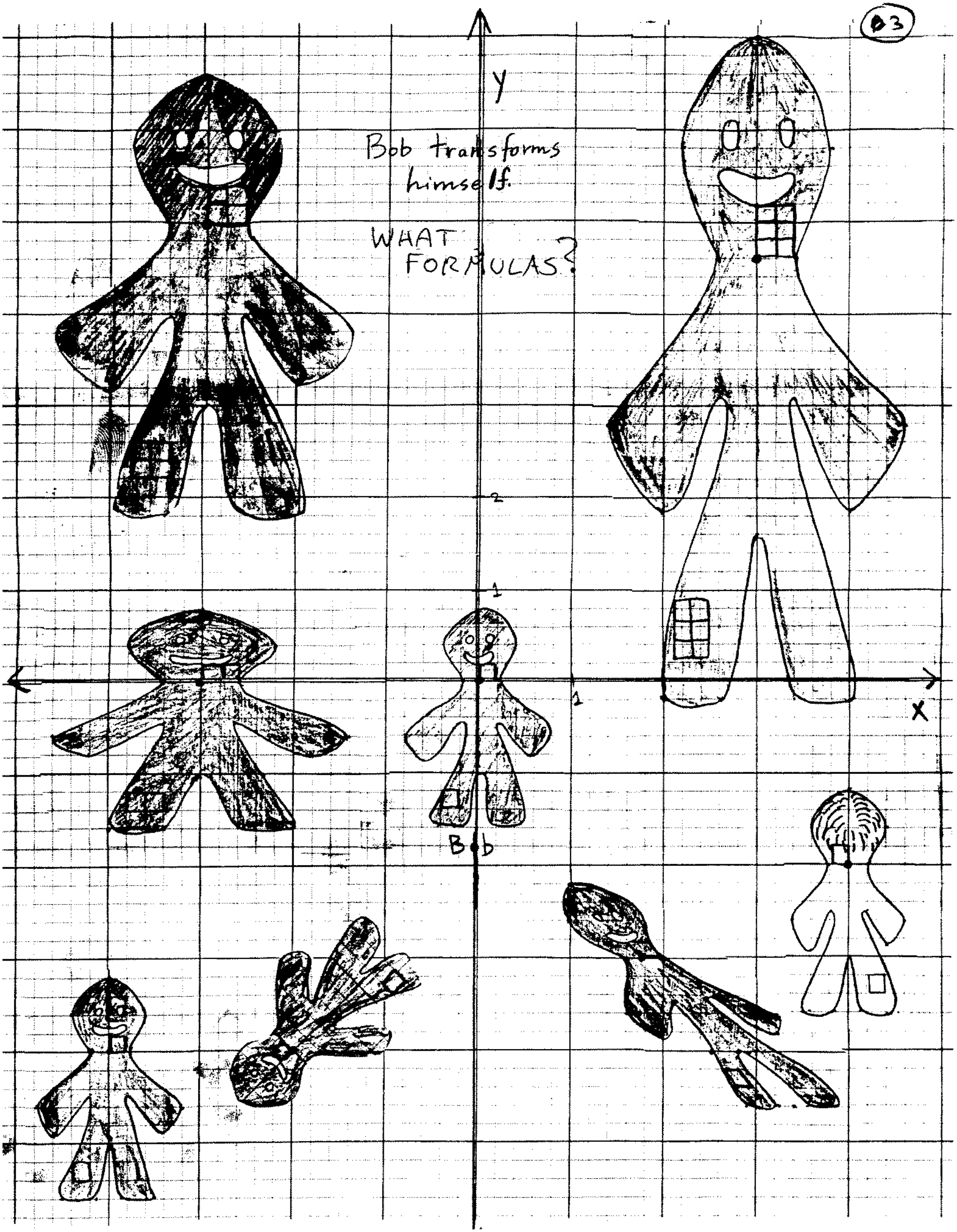
Homework Due 9/9



(1) Find formulas for the two affine maps which are shown.

(2) Show where the L-box is transformed to by

$$a\begin{pmatrix}x\\y\end{pmatrix}=\begin{bmatrix}2 & 2\\-2 & 2\end{bmatrix}\begin{bmatrix}x\\y\end{bmatrix}+\begin{bmatrix}-4\\-3\end{bmatrix}$$


y
Bob transforms himself.
WHAT FORMULAS?
2
1
1
x
Bob

easy transformations:

translation:

$$a\left(\begin{bmatrix}x\\y\end{bmatrix}\right) = \begin{bmatrix}x\\y\end{bmatrix} + \begin{bmatrix}1\\2\end{bmatrix} = \begin{bmatrix} & \\ & \end{bmatrix}\begin{bmatrix}x\\y\end{bmatrix} + \begin{bmatrix} \\ \end{bmatrix}$$

scaling and translation:

$$a\left(\begin{bmatrix}x\\y\end{bmatrix}\right) = \begin{bmatrix}2x\\5y\end{bmatrix} + \begin{bmatrix}3\\-2\end{bmatrix} = \begin{bmatrix} & \\ & \end{bmatrix}\begin{bmatrix}x\\y\end{bmatrix} + \begin{bmatrix} \\ \end{bmatrix}$$

reflection: (across y-axis)

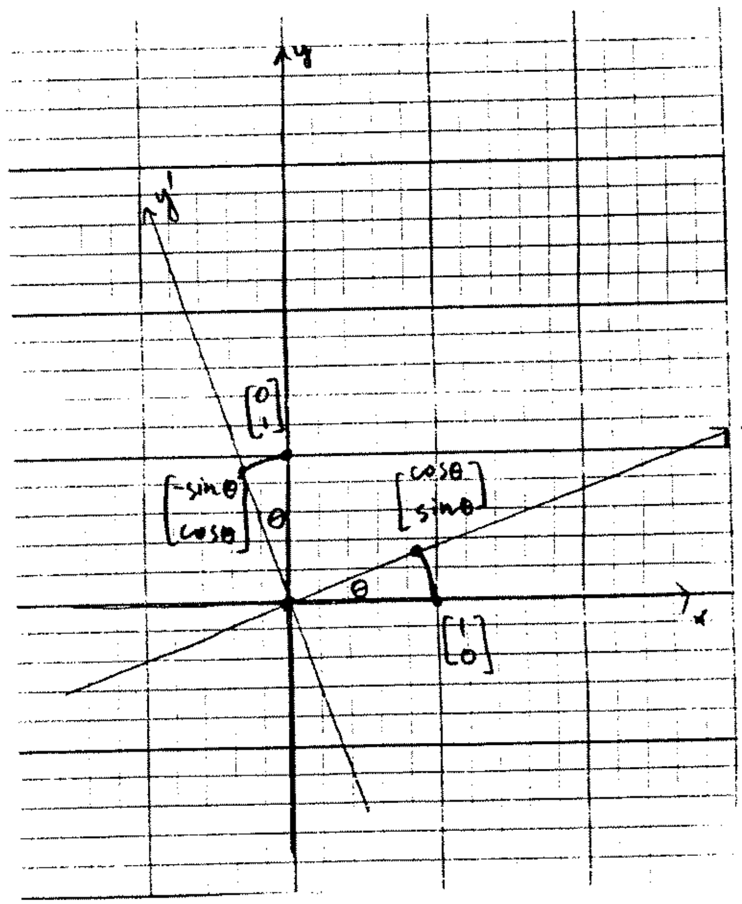
$$a\left(\begin{bmatrix}x\\y\end{bmatrix}\right) = \begin{bmatrix}-x\\y\end{bmatrix} = \begin{bmatrix} & \\ & \end{bmatrix}\begin{bmatrix}x\\y\end{bmatrix} + \begin{bmatrix}0\\0\end{bmatrix}$$

etc.

also rotations

rotate by θ radians counterclockwise:

$$a\left(\begin{bmatrix}x\\y\end{bmatrix}\right) = \begin{bmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{bmatrix}\begin{bmatrix}x\\y\end{bmatrix}$$



also (later) reflections thru arbitrary lines...