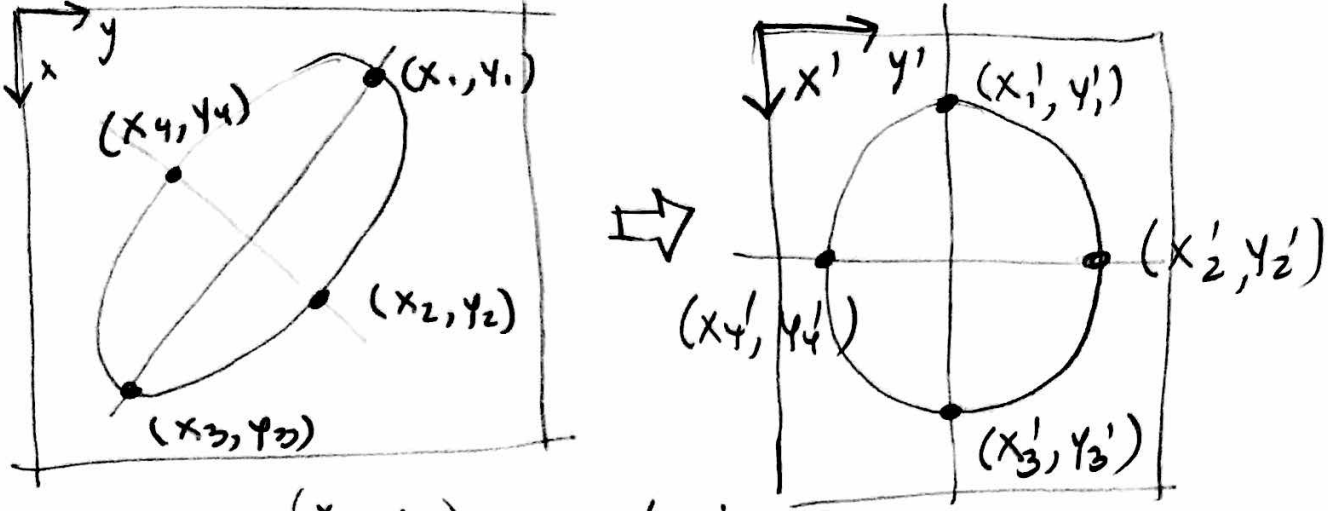

$$(x_i, y_i) \longrightarrow (x_i', y_i') \qquad i = 1 \dots n \qquad n = 4$$

$$x_i = a_{11} x_i' + a_{12} y_i' + a_{13}$$
$$y_i = a_{21} x_i - a_{22} y_i' + a_{23}$$

$$\begin{bmatrix} x_i' & y_i' & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & x_i & y_i & 1 \end{bmatrix} \begin{bmatrix} a_{11} \\ a_{12} \\ a_{13} \\ a_{21} \\ a_{22} \\ a_{23} \end{bmatrix} = \begin{bmatrix} -x_i \\ -y_i \end{bmatrix}$$

X_i ↑ a ↑ b_i

$$X_i a = b_i$$

$$\begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \end{bmatrix} a = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix}$$

$$X a = b \Rightarrow \boxed{a = \left[X X^T\right]^{-1} X^T b}$$