

MATH425 Problem 9 submission

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2/26/2022

9. Find the 3×3 matrices that produce the described composite 2D transformations, using homogeneous coordinates. Apply the transformations to the **letter N** data, “letterN.pny” and submit the corresponding plots as well.

- (a) Translate by $(-2, 3)$, and then scale the x -coordinate by 0.8 and the y -coordinate by 1.2

$$\begin{bmatrix} .8 & 0 & 0 \\ 0 & 1.2 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -2 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} .8 & 0 & -1.6 \\ 0 & 1.2 & 3.6 \\ 0 & 0 & 1 \end{bmatrix}$$

- (b) Rotate points $\frac{\pi}{6}$, and then reflect through the x -axis. For this problem since it is not specified I will be rotating counter clockwise

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos \frac{\pi}{6} & -\sin \frac{\pi}{6} & 0 \\ \sin \frac{\pi}{6} & \cos \frac{\pi}{6} & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} \cos \frac{\pi}{6} & -\sin \frac{\pi}{6} & 0 \\ -\sin \frac{\pi}{6} & -\cos \frac{\pi}{6} & 0 \\ 0 & 0 & 1 \end{bmatrix}$$