MATH425 Problem 9 submission

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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

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

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

$$
\begin{bmatrix} \cos\dfrac{\pi}{6} & -\sin\dfrac{\pi}{6} & 0 \\[2mm] \sin\dfrac{\pi}{6} & \cos\dfrac{\pi}{6} & 0 \\[2mm] 0 & 0 & 1 \end{bmatrix}
\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}
=
\begin{bmatrix} \cos\dfrac{\pi}{6} & -\sin\dfrac{\pi}{6} & 0 \\[2mm] \sin\dfrac{\pi}{6} & -\cos\dfrac{\pi}{6} & 0 \\[2mm] 0 & 0 & 1 \end{bmatrix}
$$