Give complete solutions to the following problems. Be sure to provide all the necessary steps to support your answers.

1. What $3 \times 3$ matrix will have the same effect on homogeneous coordinates for set of real numbers $\mathrm{R}^{2}$ that the shear matrix A has?

$$
\mathbf{A}=\left[\begin{array}{cc}
1 & 0 \\
1.5 & 1
\end{array}\right]
$$

2. Use matrix multiplication to find the image of the triangle with data matrix
$\mathbf{D}=\left[\begin{array}{ccc}-2 & -1 & -3 \\ 0 & 3 & 5\end{array}\right]$
under the transformation that reflects points through the y-axis. Sketch both the original triangle and its image.
3. Find the $3 \times 3$ matrix that produces the described composite 2 D transformation below, using homogeneous coordinates.
a. Translate by $(6,9)$, and then rotate 45 degrees about the origin. Confirm your answer by finding the image of $(1,1)$
b. Translate by $(-3,2)$, and then scale the $x$-coordinate by 2 and the $y$-coordinate by 3 . Confirm your answer by finding the image of $(1,1)$
c. Reflect points through the y-axis and then rotate 30 degrees about the origin. Confirm your answer by finding the images of $(1,0)$, and $(0,1)$
d. Projects points on the line $\mathrm{y}=2 \mathrm{x}$. then rotate 30 degrees about the origin. Confirm your answer by finding the images of $(1,0)$, and $(0,1)$
