54 9 40

8. Consider the function $T: \mathbb{R}^2 \to \mathbb{R}^2$, which is given by reflection across the line $y = x + 1$. Is T a linear transformation? If so, then give a matrix with $T(v) = Av$ for all $v \in \mathbb{R}^2$. If not, then show why not.

No

$T\left(\begin{bmatrix}0\\0\end{bmatrix}\right) = \begin{bmatrix}0\\1\end{bmatrix}$ because $\begin{bmatrix}0\\1\end{bmatrix}$ is on $y = x+1$

$T\begin{bmatrix}0\\2\end{bmatrix} = \begin{bmatrix}1\\1\end{bmatrix}$ Look at the picture

and $\begin{bmatrix}1\\1\end{bmatrix} \neq 2\begin{bmatrix}0\\1\end{bmatrix}$

9. Consider the function $T: \mathbb{R}^2 \to \mathbb{R}^2$, which is given by reflection across the line $y = -x$. Is T a linear transformation? If so, then give a matrix with $T(v) = Av$ for all $v \in \mathbb{R}^2$. If not, then show why not.

Yes $T\begin{bmatrix}1\\0\end{bmatrix} = \begin{bmatrix}0\\-1\end{bmatrix}$ $T\begin{bmatrix}0\\1\end{bmatrix} = \begin{bmatrix}-1\\0\end{bmatrix}$

So T is multiplication by

$$\begin{bmatrix}0 & -1\\-1 & 0\end{bmatrix}$$