**7A Introduction to Linear Transformations with Matrices**

Linear Transformations

1. The three transformations **S**, **T** and **U** are defined below. Find the image of the point (2,3) under each of these transformations. State whether each is a *linear* transformation.

$$S:\left[\begin{matrix}x\\y\end{matrix}\right]\rightarrow \left[\begin{matrix}x+4\\y-1\end{matrix}\right]$$

$$T:\left[\begin{matrix}x\\y\end{matrix}\right]\rightarrow \left[\begin{matrix}2x-y\\x+y\end{matrix}\right]$$

$$U:\left[\begin{matrix}x\\y\end{matrix}\right]\rightarrow \left[\begin{matrix}2y\\-x^{2}\end{matrix}\right]$$

Matrices can be used to represent linear transformations:

1. Find matrices to represent these linear transformations:

$$T:\left[\begin{matrix}x\\y\end{matrix}\right]\rightarrow \left[\begin{matrix}2y+x\\3x\end{matrix}\right]$$

$$V:\left[\begin{matrix}x\\y\end{matrix}\right]\rightarrow \left[\begin{matrix}-2y\\3x+y\end{matrix}\right]$$

1. The square S has coordinates (1,1), (3,1), (3,3) and (1,3).

Find the coordinates of the vertices of the image of S after the transformation given by the matrix:

$$M=\left[\begin{matrix}-1&2\\2&1\end{matrix}\right]$$