Exercise 1

Find $T(x) = Ax$ for the matrix $A$ and the vector $x$ whenever the product makes sense (i.e. the sizes of $A$ and $x$ fit together):

(i) $A = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$, $x = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$,

(ii) $A = \begin{pmatrix} 0 & 2 & 0 \\ 3 & 0 & -2 \end{pmatrix}$, $x = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}$,

(iii) $A = \begin{pmatrix} 1 & 3 & 0 \\ 1 & 4 & -1 \end{pmatrix}$, $x = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$.

Exercise 2

Use matrix multiplication to find:

(i) the reflection of the vector $(2, -4)$ about the $x$-axis;

(ii) the orthogonal projection of the vector $(2, -1)$ to the $y$-axis;

(iii) the image of the vector $(-1, 1)$ under rotation through the angle $-\frac{\pi}{3}$ about the origin.

(iv) the image of the vector $(2, 1, -1)$ under rotation through the angle $\frac{\pi}{4}$ about the $z$-axis.