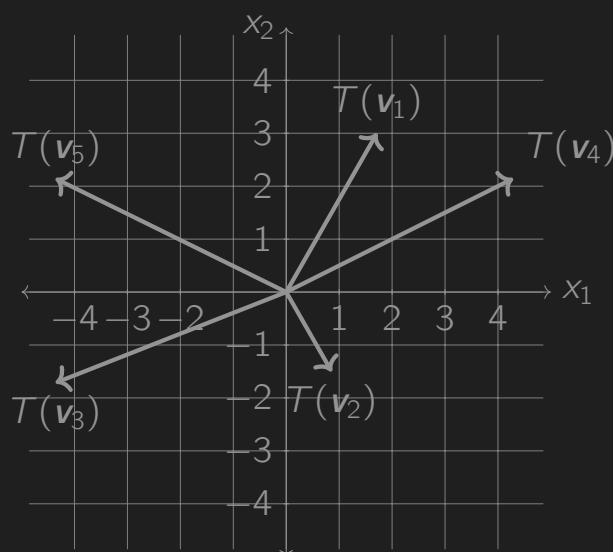
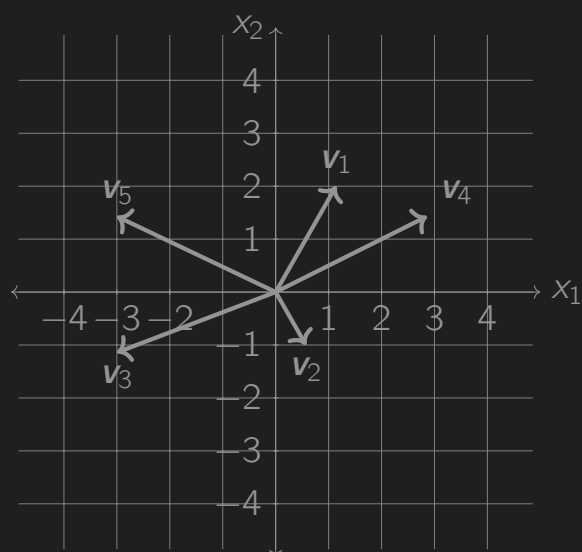


1. Let  $A = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$  and define a transformation  $S : \mathbb{R}^2 \rightarrow \mathbb{R}^2$  by  $S(\mathbf{x}) = A\mathbf{x}$ .

Describe in a sentence what  $S$  does.

- $S$  is a transformation that takes any vector  $\mathbf{x}$  in  $\mathbb{R}^2$  and scales it by  $-1$ . Scaling by negative  $-1$  simply inverts the direction, or in other words,  $S$  is a reflection through both the  $x$  and  $y$  axes.

2. Let  $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$  be the transformation that expands the plane by a factor of 1.5 in all directions (that is, all entries in the vector grow by a factor of 1.5; see below). Define a matrix  $B$  so that  $T(\mathbf{x}) = B\mathbf{x}$ .



$$B = 1.5I = \begin{bmatrix} 1.5 & 0 \\ 0 & 1.5 \end{bmatrix}$$