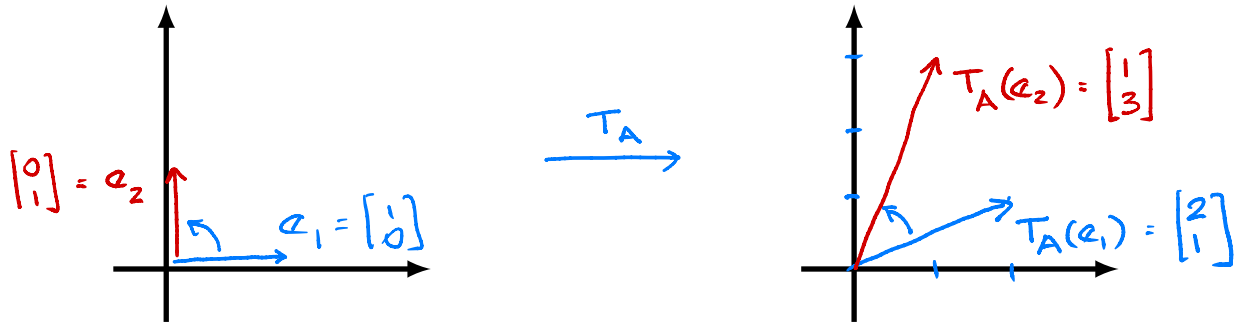
Example.

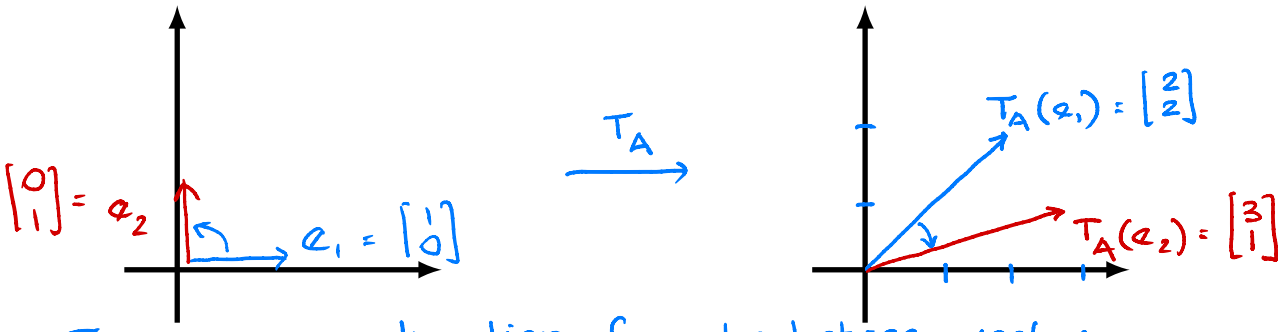
$A = \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$ $\det A = 5 > 0$ $T_A : \mathbb{R}^2 \to \mathbb{R}^2$, $v \mapsto Av$



T_A preserves direction of angles between vectors
(we say that T_A preserves orientation)

Example.

$A = \begin{bmatrix} 2 & 3 \\ 2 & 1 \end{bmatrix}$ $\det A = -4 < 0$ $T_A : \mathbb{R}^2 \to \mathbb{R}^2$, $v \mapsto Av$



T_A reverses direction of angles between vectors.
(We say that T_A reverses orientation).

Theorem

If A is a 2×2 matrix then the linear transformation $T_A \colon \mathbb{R}^2 \to \mathbb{R}^2$ preserves orientation if $\det A > 0$ and reverses orientation if $\det A < 0$.