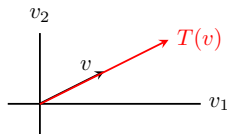# Examples in 2D

Transformations from the plane to the plane ($V = \mathbb{R}^2$, $W = \mathbb{R}^2$) are the easiest to visualize, so let's start there with examples.

**Ex A:**

$$T(v) = T(\begin{bmatrix} v_1 \\ v_2 \end{bmatrix}) = \begin{bmatrix} 2v_1 \\ 2v_2 \end{bmatrix} = 2v$$



This transformation is just a **stretch**. Is it linear? Yes:

$$T(c_1 u + c_2 v) = 2(c_1 u + c_2 v) = c_1(2u) + c_2(2v) = c_1 T(u) + c_2 T(v)$$

**Ex B:**

$$T(v) = T(\begin{bmatrix} v_1 \\ v_2 \end{bmatrix}) = \begin{bmatrix} -v_2 \\ v_1 \end{bmatrix}$$