Some Examples

With the previous result we can not only represent vectors and linear transformations on a computer, but we can also apply the transformation to vectors to get other vectors! It is just matrix multiplication.

Let's look now at some computation of coordinate matrices for linear transformations.

Ex: First take $V = W = \mathbb{R}^2$ and

$$E = (e_1, e_2), H = (h_1, h_2) = (\begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \end{bmatrix})$$

and consider the linear transformation

$$T(v) = T(\begin{bmatrix} v_1 \\ v_2 \end{bmatrix}) = \begin{bmatrix} 3v_1 + v_2 \\ -v_1 \end{bmatrix}$$

Compute T applied to the basis E of V:

$$T(e_1) = T(\begin{bmatrix} 1 \\ 0 \end{bmatrix}) = \begin{bmatrix} 3 \\ -1 \end{bmatrix}, T(e_2) = T(\begin{bmatrix} 0 \\ 1 \end{bmatrix}) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$