



## Why

All linear transformations are equivalent to multiplication by a matrix.

## Main Result

**Prop. 1.** *Let  $(V_1, \mathbf{F})$ ,  $(V_2, \mathbf{F})$  be two vector spaces and  $f : V_1 \rightarrow V_2$  be a transformation between them.*

*If  $f$  is linear, then there exists bases for the spaces and a matrix  $A$  in  $\mathbf{F}$  for which matrix multiplication is equivalent to applying  $f$ .*

*If  $A$  is a matrix in  $F$   $f$  is linear if and only if there exists a matrix in  $\mathbf{F}$  whose coordinates in  $V_1$  to coordinates in  $V_2$ .*



