### 1 | Axler3.30 #def matrix $A_{i,k}$

def

A mn matrix is a rectangle of numbers with m rows and n columns. And other stuff you would expect

### 2 | Axler3.32 #def matrix of a linear map, $\mathcal{M}(T)$

def

Suppose  $T \in \mathcal{L}(V,W)$  and  $v_1,\ldots,v_n$  is a basis of V and  $w_1,\ldots,w_m$  is a basis of W. The *matrix* of T with respect to these bases is the  $m \times n$  matrix  $\mathcal{M}\left(\mathcal{T},\left(v_1,\ldots,v_n\right),\left(w_1,\ldots,w_m\right)\right)$  whose entries  $A_{j,k}$  are defined by

$$Tv_k = A_{1,k}w_1 + \dots + A_{m,k}w_m$$

.

Note that for each output  $Tv_k$  is a linear combination of a column.

### 3 | Algebra things

#### 3.1 | Axler3.35 #def Matrix Sum

def

Pointwise addition, pretty straight forward. Only works on matrices of the same size!

#### 3.2 | Axler 3.36 The matrix sum of linear maps

Basically matrices that are linear maps also satisfie additivity of linear maps (Given  $S, T \in \mathcal{L}(V, W), \mathcal{M}(S) + \mathcal{M}(T) = \mathcal{M}(S + T)$ )

#### 3.3 | Axler3.37 and Axler3.38 (same for scalar multiplication)

Its the same for scalar multiplication, yay

### 4 | Notation Axler3.39 $\mathbb{F}^{m,n}$

notation

 $F^{m,n}$  is the set of all  $m \times n$  matrices with entries in  $\mathbb{F}$ .

## 5 | Axler3.40 dim $\mathbb{F}^{m,n}=mn$

 $\mathbb{F}^{m,n}$  is itself a vector space with dimension mn. (Each basis vector being a matrix with a single one at i, j for each pair of i, j)?

## 6 | Axler3.44 $A_{j,\cdot}$ , $A_{\cdot,k}$

The dot just means "everything in that row/column".

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# 7 | Axler3.49 Column of matri product equal matrix times column

For  $m\times n$  matrix A and  $n\times p$  matrix C ,  $(AC)_{\cdot,k}=AC_{\cdot,k}$ 

# 8 | And many other ways to think about matrix multplication

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