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

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

.

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".

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