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#ref #disorganized #incomplete

1 | #definition dimension

The dimension of V (denoted dim V is the length of a basis in V - This relies on Axler2.35: Basis length does not depend on the basis Any two bases of a finite-dimensional vector space have the same length

1.1 | Results

1.2 | Axler2.38 Dimension of a subspace

If V is finite-dimensional and U is a subspace of V, then dim $U \leq$ dim V - Intuitive. The basis of a subspace is shorter than the basis of the original vecspace, because otherwise it's span would be larger than the original vecspace (because bases are linearly independent + len lin-indep $\leq$ len span).

1.3 | Axler2.39 Linearly independent list of the right length is a basis

All linearly independent lists of the length dim V are bases. - Intuitive. If it's already linearly independent meaning each element brings "new information", then if there's that many elements then there should be that much information.

1.4 | Axler2.43 Dimension of a sum

If U_1 and U_2 are subspaces of a finite dimensional vecspace, then

$$\text{dim}(U_1 + U_2) = \text{dim } U_1 + \text{dim } U_2 - \text{dim}(U_1 \cap U_2)$$

- This inducts into something analogous to PIE! [[KBrefPrincipleInclusionExclusion]]
