If V is a subspace of $\mathbb{R}^n$, the dimension of V is the number of vectors in a basis of V

↳ A weird side effect is a basis of $\vec{0}$ has 0 vectors in it

If we have a matrix A:

the dimension of $\ker(A)$ is called the nullity of A.

the dimension of $\text{im}(A)$ is called the rank of A.

The Rank-Nullity Theorem states that for a matrix A, $\dim(\text{im}(A)) + \dim(\ker(A)) = \dim(\text{domain of } A)$

$$\text{rank} + \text{nullity} = \dim(\text{domain})$$

Some useful Facts/equivalent things:

The nullity = number of free variables in rref (A)

The rank = number of leading ones in rref (A)

The dimension of the domain = the number of columns of A

The rank is upper bounded by the dim (co-domain), or the number of rows of A.

The nullity is upper bounded by the dim(domain), or the number of columns of A.