the span

Question 1:

Answer 1:

Question 2:

Answer 2:

example

linear dependence and independence

the span

Question 1: Geometrically, what is the span of a single vector?

Answer 1: It's a line.

Question 2: What is the span of two vectors?

Answer 2: It could be a plane, but in special cases, it could actually be a line. This will happen if one vector is just the scalar multiplication of the other: $\overrightarrow{v_2} = k\overrightarrow{v_1}$. In that case, we can never "leave" the line.

example

You expect two vectors $\overrightarrow{v_1} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$, $\overrightarrow{v_2} = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$ to span the entire 2D plane ($\mathbb{R}^2$), but in fact, they only span a subspace of the plane – a single line. Can you see why?

This leads us to a very important concept in linear algebra: linear dependence and independence

linear independence