

Linear Combination Of Vectors

$$\vec{x} = [x_1, x_2, \dots, x_n] = x_1[1, 0, 0, \dots, 0] + x_2[0, 1, 0, \dots, 0] + \dots + x_n[0, 0, 0, \dots, 1]$$

$$\text{Linear Combination of } [\vec{y}_1, \vec{y}_2, \dots, \vec{y}_n] = a_1\vec{y}_1 + a_2\vec{y}_2 + \dots + a_n\vec{y}_n$$

The 3 Important Concepts

$$\text{Solutions of } A_{mn}\vec{x} = \vec{0} \Leftrightarrow \text{subspace of } \mathbb{R}^n$$

$$\text{Solutions of } A_{mn}\vec{x} = \vec{0} \Leftrightarrow \text{span} \{ \vec{y}_1, \vec{y}_2, \dots, \vec{y}_n \}$$

$$\text{span} \{ \vec{y}_1, \vec{y}_2, \dots, \vec{y}_n \} \Leftrightarrow \text{subspace of } \mathbb{R}^n$$

Mathematically, these 3 concepts are the same thing!

Example of using the Big Three

$$\text{XY Plane in } \mathbb{R}^3 = \text{span} \left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \right\} = [0, 0, 1]\vec{x} = 0$$