

Math 54 Lec4

homogenous system

non-homogenous system

Span

How to tell whether indep. or dep.

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homogenous system

$$A\mathbf{x} = \mathbf{0}$$

Just look at A is sufficient.

non-homogenous system

$$A\mathbf{x} = \mathbf{b}$$

Need to look at augmented matrix in this case.

General: one particular solution + general solution to homogeneous counterpart.

$$A\mathbf{x}_1 = \mathbf{b}, A\mathbf{x}_2 = \mathbf{b} \Rightarrow A(\mathbf{x}_1 - \mathbf{x}_2) = \mathbf{0}$$

Span

A is an $m \times n$ matrix. A can be viewed as n vectors in \mathbb{R}^m

A set of vectors $\{\mathbf{v}_1, \mathbf{v}_2, \dots, \mathbf{v}_n\}$ is called **linearly independent**, if the equation $c_1\mathbf{v}_1 + c_2\mathbf{v}_2 + \dots + c_n\mathbf{v}_n = \mathbf{0}$ has no nontrivial solution (i.e. not all $c_i = 0$). i.e. if this has only the trivial solution.

linearly dependent if $c_1\mathbf{v}_1 + c_2\mathbf{v}_2 + \dots + c_n\mathbf{v}_n = \mathbf{0}$ does have a nontrivial solution.

How to tell whether indep. or dep.

Take

$$A = [\mathbf{v}_1 \quad \mathbf{v}_2 \quad \dots \quad \mathbf{v}_n]$$

Does $A\mathbf{x} = \mathbf{0}$ have a nontrivial solution.

Say we have n vectors in \mathbb{R}^m , if $n > m$, then this set of vectors is **always linearly dependent**.