

Linear Algebra

Midterm 1 Study Guide

Intro to Linear Algebra

Natural Language → Equation Language → Linear Algebra Language

"she has x quarters and y dimes for a total of 60¢ in 3 coins"

$$\begin{cases} x + y = 3 \\ 25x + 10y = 60 \end{cases}$$

System of Equations

- a solution set of a system of equations is a set of #s that make all the equations true
- inconsistent → no solution
- consistent → there is a solution.

$$\left[\begin{array}{c|cc|c} & 1 & 2 & 3 \\ \hline 1 & 25 & 10 & 3 \\ 2 & 25 & 10 & 60 \end{array} \right]$$

Matrix Vector

$$\left[\begin{array}{c|cc|c} & 1 & 1 & 3 \\ \hline 1 & 25 & 10 & 60 \end{array} \right]$$

Augmented Matrix just the #s

we use matrices when systems of equations are too hard to solve algebraically

matrices are a very efficient way of storing info, since they just hold #s and don't waste space w/ operations and variables

Some Vectors Review

we write vectors vertically, like a matrix w/ 1 column

we can add vectors and multiply them by scalars by just doing each operation on each row.

Multiplying two vectors is a dot product (rn for our purposes)

a span of k vectors is a collection of all possible linear combinations made up of those vectors.

Span {v₁, ..., v_k} = c₁v₁ + ... + c_kv_k

Linear Combinations

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

all equivalent forms

$$\left[\begin{array}{c|cc|c} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{array} \right] \left[\begin{array}{c} x \\ y \\ z \end{array} \right] = \left[\begin{array}{c} b_1 \\ b_2 \\ b_3 \end{array} \right]$$

column picture aka linear combination of vectors

$$x \left[\begin{array}{c} 1 \\ 4 \\ 7 \end{array} \right] + y \left[\begin{array}{c} 2 \\ 5 \\ 8 \end{array} \right] + z \left[\begin{array}{c} 3 \\ 6 \\ 9 \end{array} \right] = \left[\begin{array}{c} b_1 \\ b_2 \\ b_3 \end{array} \right]$$

this setup is aka...

Linear Combinations

so to solve we wanna get our matrix as close to the identity matrix as possible

we use these in the RREF

that is what the RREF is

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