

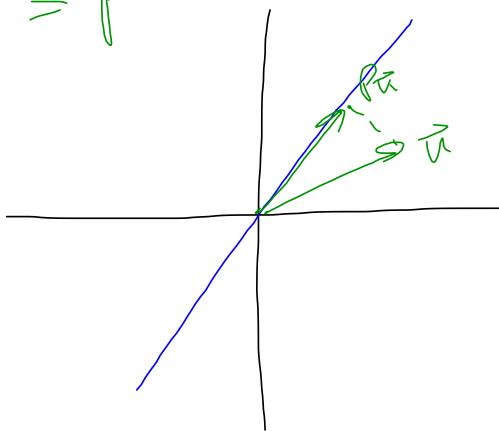
$$A = \begin{bmatrix} \checkmark & \checkmark & \checkmark \\ \checkmark & \checkmark & \checkmark \end{bmatrix} \quad B = \begin{bmatrix} \checkmark & \times \\ \checkmark & \checkmark \end{bmatrix} \quad C = \begin{bmatrix} \times & \checkmark & \checkmark \\ \times & \checkmark & \checkmark \\ \checkmark & \checkmark & \times \end{bmatrix}$$

$2 \times 3$    $3 \times 3$

~~AB~~      AC

**BA** Yes      ~~CA~~      AC =  $\begin{bmatrix} \times & \times & \times \\ \times & \times & \times \end{bmatrix}$

$$P^2 = P$$



$$P(P\vec{u}) = P\vec{u}$$

$$5x + 3y = 2$$

$$x - 2y = 7$$

$$\begin{bmatrix} 5 & 3 \\ 1 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 7 \end{bmatrix}$$

$$A = \begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix} \quad C = \begin{bmatrix} 3 & -2 \\ -7 & 5 \end{bmatrix} = A^{-1}$$

$$AC = CA = I \implies \begin{array}{l} \text{same} \\ \text{A and C are} \\ \text{inverses} \end{array}$$

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}^{-1} = \frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$$\begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix}^{-1} = \frac{1}{15-14} \begin{bmatrix} 3 & -2 \\ -7 & 5 \end{bmatrix} = \begin{bmatrix} 3 & -2 \\ -7 & 5 \end{bmatrix}$$

Determinant

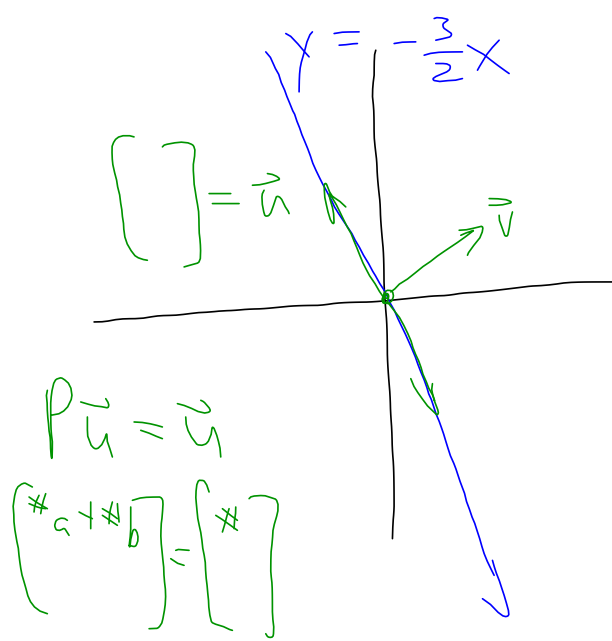
$$A = \begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix}$$

To find  $A^{-1}$ , we create  $[A|I]$  and rref  
to get  $[I|B]$ .  $B = A^{-1}$

$$[A|I] = \begin{bmatrix} 5 & 2 & 1 & 0 \\ 7 & 3 & 0 & 1 \end{bmatrix}$$

$$\begin{aligned}
 &\text{Solve} \\
 &3x = 5 \\
 &\frac{1}{3}(3x) = \frac{1}{3}(5) \\
 &\left(\frac{1}{3} \cdot 3\right)x = \frac{5}{3} \\
 &1x = \frac{5}{3} \\
 &x = \frac{5}{3}
 \end{aligned}$$

$$\begin{aligned}
 &\text{Solve } A\vec{x} = \vec{b} \\
 &A^{-1}(A\vec{x}) = A^{-1}\vec{b} \\
 &(A^{-1}A)\vec{x} = A^{-1}\vec{b} \\
 &I\vec{x} = A^{-1}\vec{b} \\
 &\vec{x} = A^{-1}\vec{b}
 \end{aligned}$$



$$P = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

## Inverses

- ① How do we recognize?  $AB=BA=I$
- ② How do we find an inverse?
  - \* Formula for  $2 \times 2$
  - \* Process for larger
- ③ Why do we care about inverses?



