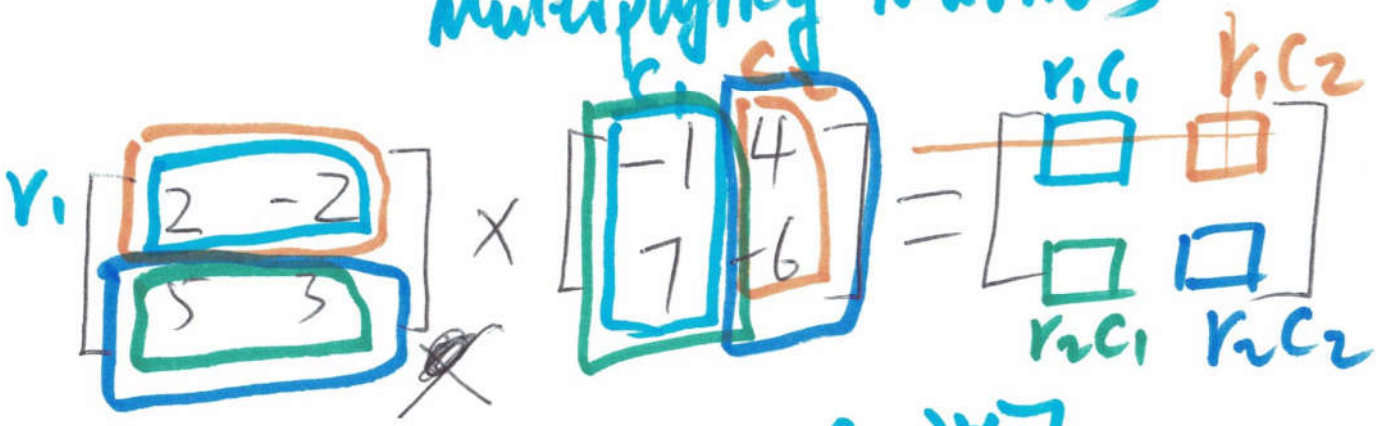
Multiplying Matrices



$r_1c_1 = 2 \times (-1) + (-2) \times 7 =$

$r_1c_2 = 2 \times 4 + (-2) \times (-6) =$

$r_2c_1 = 5 \times (-1) + 3 \times 7 =$

$r_2c_2 = 5 \times 4 + 3 \times (-6) =$

△ reciprocal

$8 \longrightarrow \frac{1}{8}$

$A \longrightarrow A^{-1}$ inverse

$A \times A^{-1} = I$ identity Matrix

$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ A 3x3 Identity Matrix

△ It has 1s on the diagonal and 0s everywhere else. → Identity matrix

△ what matrices can have ~~one~~ inverse matrices?

→ It has to be square.

same number of rows and columns.

△ The identity matrix can be 2x2, or 3x3. or 4x4, etc.

$$A \times A^{-1} = A^{-1} \times A = I$$

Sometimes, there is no inverse at all.

△ How do you calculate the inverse matrix?

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

$\frac{1}{ad-bc}$ → determinant

$$\begin{bmatrix} 4 & 7 \\ 2 & 6 \end{bmatrix}^{-1} = \frac{1}{24-14} \begin{bmatrix} 6 & -7 \\ -2 & 4 \end{bmatrix} = \frac{1}{10} \cdot \begin{bmatrix} 6 & -7 \\ -2 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} 0.6 & -0.7 \\ -0.2 & 0.4 \end{bmatrix}$$

$$\begin{bmatrix} 4 & 7 \\ 2 & 6 \end{bmatrix} \times \begin{bmatrix} 0.6 & -0.7 \\ -0.2 & 0.4 \end{bmatrix}$$

$$= \begin{bmatrix} 2.4 - 1.4 & -2.8 + 2.8 \\ 1.2 - 1.2 & -1.4 + 2.4 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 4 & 7 \\ 2 & 6 \end{bmatrix} \times \begin{bmatrix} 0 & ? \\ 1 & ? \end{bmatrix} = \begin{bmatrix} 4 & 7 \\ 2 & 6 \end{bmatrix}$$

○ The purpose of getting the inverse matrix?

$$A \times x = b$$

$$\Rightarrow A^{-1} \times A \times x = A^{-1} \times b$$

$$I \times x$$

$$\boxed{x = A^{-1} \times b}$$

Example:

$$\begin{cases} 3a+4b+5c=2 \\ 2a+6b-3c=3 \\ 7a+9b-4c=5 \end{cases}$$

$$A=\begin{bmatrix} 3 & 4 & 5 \\ 2 & 6 & -3 \\ 7 & 9 & -4 \end{bmatrix}$$

OR:

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x=A\b;
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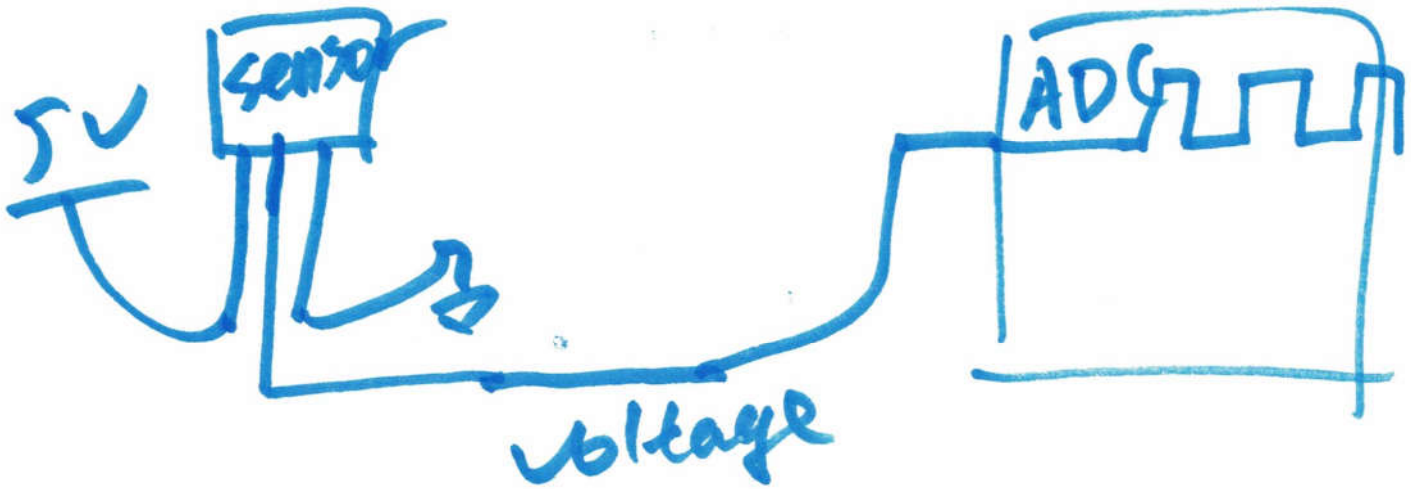
$$x=\begin{bmatrix} a \\ b \\ c \end{bmatrix}, \quad b=\begin{bmatrix} 2 \\ 3 \\ 5 \end{bmatrix}$$

$$x=A^{-1}*b$$

inv(A)

(b)



$$T = C_1 V + C_2$$