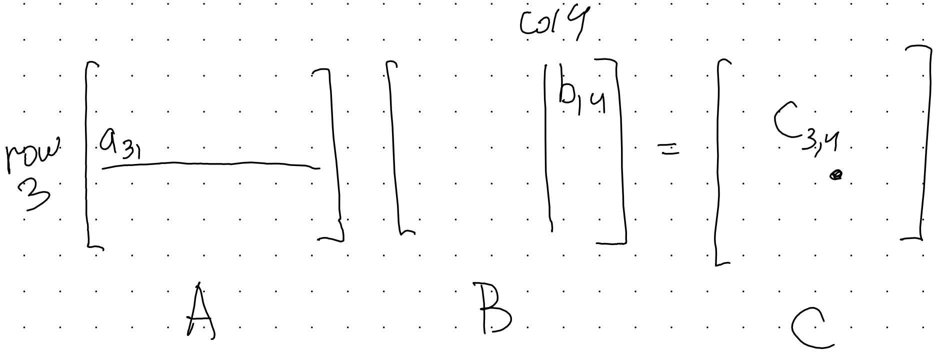
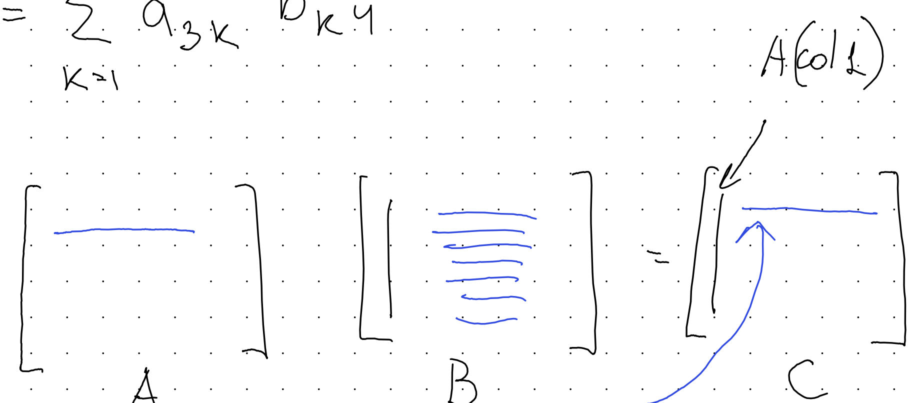


$$c_{34} = (\text{Row } 3 \text{ of } A) \cdot (\text{Col } 4 \text{ of } B) =$$

$$= a_{31} b_{14} + a_{32} b_{24} + \dots$$

$$= \sum_{k=1}^{n} a_{3k} b_{k4}$$



columns of C are combinations of columns of A

rows of C are combinations of rows of B

4th method for multiplication

Block multiplication

Inverses (square m.)

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

if $\exists$

invertible, non singular

Singulare case

$A = \begin{bmatrix} 1 & 3 \\ 2 & 6 \end{bmatrix}$ no inverse if you can find a vector $x \neq 0$ with $Ax = 0$

$$Ax = \begin{bmatrix} 1 & 3 \\ 2 & 6 \end{bmatrix} \begin{bmatrix} 3 \\ -1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

I A^{-1} exist then

$$A^{-1} A x = 0$$

$$I x \neq 0$$

Find inverse

$$\begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix} \underbrace{\begin{bmatrix} a & c \\ b & d \end{bmatrix}}_{A^{-1}} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Gauss-Jordan (solves 2 eq. at once)

$$\begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix} \begin{bmatrix} c \\ d \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\left[\begin{array}{cc|cc} 1 & 3 & 1 & 0 \\ 2 & 7 & 0 & 1 \end{array}\right] \rightarrow \left[\begin{array}{cc|cc} 1 & 3 & 1 & 0 \\ 0 & 1 & -2 & 1 \end{array}\right]$$

$\quad A \qquad\quad I$

$$\rightarrow \left[\begin{array}{cc|cc} 1 & 0 & 7 & -3 \\ 0 & 1 & -2 & 1 \end{array}\right]$$

$$E\,[A \mid I] = [I \mid A^{-1}]$$

elimination matrix is A^{-1}

Recitation

$$A = \begin{bmatrix} a & b & b \\ a & a & b \\ a & a & a \end{bmatrix}$$

$$\begin{array}{c} -1 \\ -1 \\ \end{array} \left[\begin{array}{ccc|ccc} a & b & b & 1 & 0 & 0 \\ a & a & b & 0 & 1 & 0 \\ a & a & a & 0 & 0 & 1 \end{array}\right] = \begin{array}{c} \\ \\ -1 \end{array} \begin{bmatrix} a & b & b & 1 & 0 & 0 \\ 0 & a-b & 0 & -1 & 1 & 0 \\ 0 & a-b & a-b & -1 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} a & b & b & 1 & 0 & 0 \\ 0 & a-b & 0 & -1 & 1 & 0 \\ 0 & 0 & a-b & 0 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & b/a & b/a & 1/a & 0 & 0 \\ 0 & 1 & 0 & -\frac{1}{a-b} & \frac{1}{a-b} & 0 \\ 0 & 0 & 1 & 0 & -\frac{1}{a-b} & \frac{1}{a-b} \end{bmatrix}$$

A is not invertable if $a=0$ or $a=b$