Math Review, Sept 10^{th}

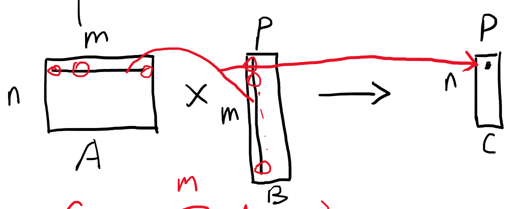
A : $n \times m$

$+/-$: same dimensions

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

$$- \qquad \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

multiplication:



$$C_{11} = \sum_{k=1}^{m} A_{1k} \cdot B_{k \cdot 1}$$

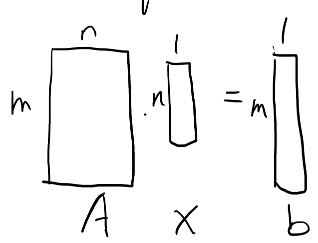
matrix inverse

$$\boxed{A^{-1} \cdot A = I} \overset{?}{\Longrightarrow} A \cdot A^{-1} = I$$

$$\Downarrow$$

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

Linear equation

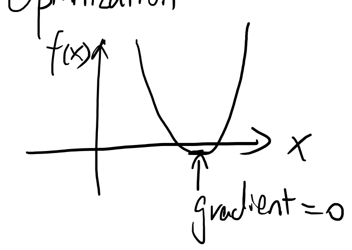


if $n = m$ then $x = A^{-1} \cdot b$

$3x_1 + 2x_2 = b_1$ 2 equ. 3 unknowns

$6x_2 + 10x_3 = b_2$ $\Downarrow$ infinite solutions

Optimization



Lagrangian for constrained prob.

min $f(x)$

s.t. $g(x) \leq 0$ λ, μ > Lagrange multiplier

$h(x) = 0$

$$\mathcal{L} = f(x) + \lambda \cdot g(x) + \mu \cdot h(x)$$

→ unconstrained problem

$$\frac{\partial \mathcal{L}}{\partial x} = 0 \qquad \partial f + \lambda \cdot \partial g + \mu \cdot \partial h = 0$$

$h(x) = 0$ $\mu \neq 0$ $\mu \geq 0$