

Math Review, Sept 10th

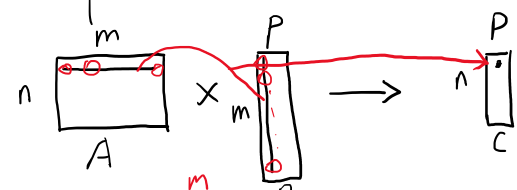
$A: n \times m$ $\begin{matrix} n \\ \downarrow \\ m \end{matrix}$

+/- : same dimensions

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

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

multiplication:



$$C_{ii} = \sum_{k=1}^m A_{ik} \cdot B_{k,i}$$

matrix inverse

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

\Downarrow

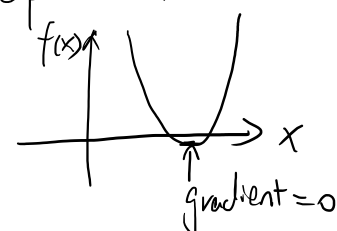
$$\begin{aligned} A \cdot A^{-1} \cdot A &= A \cdot I \\ &= A \\ &= I \cdot A \end{aligned}$$

Linear equation

$$\begin{matrix} n \\ \downarrow \\ m \end{matrix} \begin{matrix} 1 \\ \downarrow \\ n \end{matrix} = \begin{matrix} 1 \\ \downarrow \\ m \end{matrix} \quad \text{if } n=m \text{ then } x=A^{-1} \cdot b$$

$$\begin{aligned} 3x_1 + 2x_2 &= b_1 \\ 6x_2 + 10x_3 &= b_2 \end{aligned} \quad \begin{matrix} 2 \text{ eqn. } 3 \text{ unknowns} \\ \downarrow \\ \text{infinite solutions} \end{matrix}$$

Optimization



Lagrangian for constrained prob.

min $f(x)$

$$\text{s.t. } \begin{aligned} g(x) &\leq 0 \\ h(x) &= 0 \end{aligned} \quad \begin{matrix} \lambda \\ \mu \end{matrix} > \text{Lagrange multiplier}$$

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

\rightarrow unconstrained problem

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

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