선형대수학 -- 1. Systems of Linear Equations and Matrices.

NO. #1

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· Matrix : rectangular array of numbers.

· Linear Equations
  - $ax+by=c$ → xy 좌표에서 직선의 표시.
  - $ax+by+cz=d$ → xyz-coordinates. 평면의 표시
  - $a_1x_1+a_2x_2+\cdots+a_nx_n=b$ → in $x_1 \cdots x_n$-coordinates, plane.

  ↓ 0 대신 homogeneous - "동차" "제차"

i.e. $x+3y=7$: linear $x+3y^2=0$: non-linear.

$3x+2y-xy=0$: non-linear $\sin\sim$, $\sqrt{\sim}$: non-linear.

· System of linear equations (linear system) → 미지수(unknowns).

(general form of linear system.
: n equations in the n unknowns.

↳
$$\begin{aligned} a_{11}x_1+a_{12}x_2+\cdots+a_{1n}x_n&=b_1\\ a_{21}x_1+a_{22}x_2+\cdots+a_{2n}x_n&=b_2\\ &\vdots\\ a_{m1}x_1+a_{m2}x_2+\cdots+a_{mn}x_n&=b_m \end{aligned}$$

↓

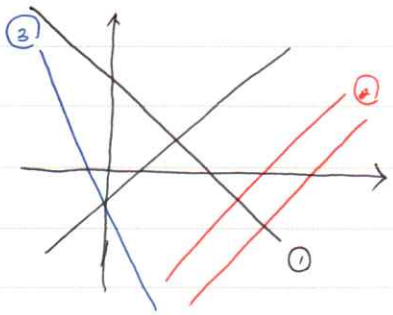
Solution sequence 순서.

↳

$x_1=s_1, x_2=s_2, \cdots, x_n=s_n$.

$\Leftrightarrow (s_1, s_2, \cdots s_n)$. → "tuple" "ordered array"

- Linear Systems in two or three unknowns.
  - $a_1x + b_1y = c_1$
    $a_2x + b_2y = c_2$.



① One unique solution. (consistant)
② No solution. (Inconsistant)
③ Infinitely many solutions. (Consistant)

* Consistant (일치한다). → 해를 갖는 경우의 사실.
Inconsistant (일일치한다). → 갖지 못하는 경우의 사실.

- $a_1x + b_1y + c_1z = d_1$
  $a_2x + b_2y + c_2z = d_2$
  $a_3x + b_3y + c_3z = d_3$

*figure 1.1.2, page 4, book.

3개의 가능성.. (요약) →
① One solution.
② No solution.
③ Infinitely many solutions.

There is no other possibilities.

- ex2, page 5. $x - y = 1$, $2x + y = 6$. ($\neq$ $\neq$) → one solution.
- ex3, page 5. $x + y = 4$, $3x + 3y = 6$ (×3, ×3, 6?), $0 = -6$. → no solution.
- ex4. $4x - 2y = 1$, $16x - 8y = 4$ (×4, ×4, ×4) → infinitely many solutions.

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· ex5, page 6. $x - y + 2z = 5$.
$2x - 2y + 4z = 10$.
$3x - 3y + 6z = 15$.

* using params
$y = s$, $z = t$. then solution $= (s - 2t + 5, s, t)$.

· Augmented Matrices and Elementary Row Operation.
(page 6, book)
↓
"Solving in systematic way"

* Augmentation: 첨가. 증대.

· 방정식 계수만으로 행렬 생성.

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} & b_1 \\ a_{21} & a_{22} & \cdots & a_{2n} & b_2 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} & b_m \end{bmatrix}$$

"방정식의 본질..!"

· 방정식 풀 때 전체 항 곱셈·대입법, 이항 → 해가 변화하지 않는다.
↳ 근본 소거 방법..!

Elementary row operations. ←
① a constant multiple.
② inter change.
③ add a constant times equation to another.

· ex6, Page 7.