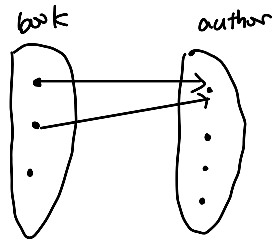
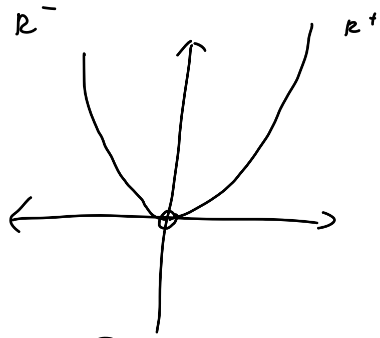
To each book written by only one author assign the author.



Not 1-1

$f: R \to R^+$ $\quad f(x) = x^4$

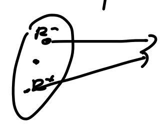


$R^- \xrightarrow{x^4} R^+$

$\boxed{0}$

R^+ $\quad x^4$

doesn't get assigned (Not a function)

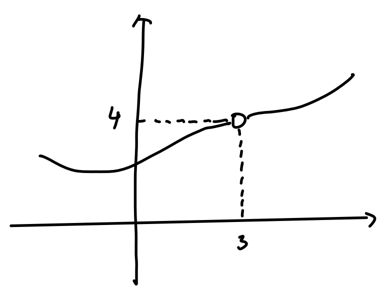


$k: R \to R$ $\quad k(x) = x^{\frac{1}{4}} = \sqrt[4]{x} \geq 0$

R^-

$f: R \to \underline{R^+ \boxed{\cup \{0\}}}$ $\quad f(x) = x^4$ onto.

or $R - R^-$



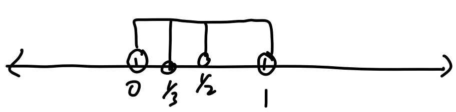
D: $(-\infty, +\infty)$

R: $\boxed{(0}, +\infty)$

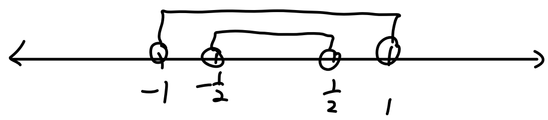
D: $(-\infty, 3) \cup (3, +\infty)$

R: $(-\infty, 4) \cup (4, +\infty)$

$\bigcap_{i=1}^{\infty} (0, \frac{1}{i}) = (0, 1) \cap (0, \frac{1}{2}) \cap (0, \frac{1}{3}) \cap \cdots$ $\quad \emptyset$



$\bigcap_{i=1}^{\infty} (-\frac{1}{i}, \frac{1}{i}) = (-1, 1) \cap (-\frac{1}{2}, \frac{1}{2}) \cap (-\frac{1}{3}, \frac{1}{3}) \cap \cdots$



$\{0\}$

\# 21. $\overset{+}{1}, -3, 9, -27, \cdots$ $\quad \underline{n \in \mathbb{Z}^+}$

$\uparrow \; a_1 \quad \uparrow \; a_2$

$\underline{\boxed{(-1)^{n+1}} \cdot 3^{n-1}}$

$1 \xrightarrow{\times -3} -3 \xrightarrow{\times -3} 9 \xrightarrow{-3} -27$

$(-3)^{n-1} = [(-1)(3)]^{n-1}$

$= \underline{\boxed{(-1)^{n-1}}} \cdot 3^{n-1}$

$n \geq 0$: $\boxed{(-1)^n}$

or $n \geq 1$: $\boxed{(-1)^{n+1}}$, $\boxed{(-1)^{n-1}}$ } Alternating sign.

$\boxed{\begin{matrix} (-1)^{even} : + \\ (-1)^{odd} : - \end{matrix}}$

$A^{-1} = \dfrac{1}{\boxed{ad-bc}} \cdot \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

$= 0$ (A^{-1} doesn't exist)

§ 2.6 Matrix.

Recall:

$\underset{m\times n}{A} \cdot \underset{n\times n}{I_n} = \underset{m\times m}{I_m} \cdot \underset{m\times n}{A} = A$

$\underset{n\times n}{A^0} = I_n \qquad A^r = \underbrace{A \cdot A \cdot A \cdot A \cdots A}_{r \text{ times}}$

Ex. A^3, A^4, A^5

$\boxed{\text{square Matrix}}$

$A: m\times n$

$\underset{m\times n}{A} \times \underset{m\times n}{A}$, $n = m$

1. Transpose Let $A = [a_{ij}]$ be an $m\times n$ matrix. The transpose of A, A^T, is $n \times m$ matrix obtained by interchanging the rows and columns of A. $A^t = [b_{ij}]$

$b_{ij} = a_{ji} \quad i = 1, 2, \cdots n, \text{ and } j = 1, 2, \cdots m$

Ex. $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \Rightarrow A^T = \begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}$

$A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} = A^T = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$

$\lfloor\ 0 \quad 1 \quad 0\ \rfloor \quad , \quad \lfloor\ 0 \quad 1 \quad 0\ \rfloor$

symmetric.

Def. A square matrix A is called symmetric if $A = A^T$ thus $A = [a_{ij}]$ is symmetric if $a_{ij} = a_{ji}$ for all i and j with $1 \le i \le n$ and $1 \le j \le n$.

Not matching.

Ex. $A = \begin{bmatrix} 1 & 1 & \boxed{0} \\ 1 & 0 & \boxed{0} \\ \boxed{1} & \boxed{1} & 0 \end{bmatrix} \neq A^T$ (Not symmetric)

2. Zero-one Matrices.

A matrix all of whose entries are either 0 or 1 is called zero-one Matrix.

Join : $\vee$ $\qquad b_1 \wedge b_2 = \begin{cases} 1 & \text{if } b_1 = b_2 = 1 \\ 0 & \text{o.w} \end{cases}$

meet : $\wedge$ $\qquad b_1 \vee b_2 = \begin{cases} 1 & \text{if } b_1 = 1 \text{ or } b_2 = 1 \\ 0 & \text{o.w} \end{cases}$

Ex. Find Join and meet of zero-one Matrices

$$A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \qquad B = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix}$$

$$A \vee B = \begin{bmatrix} 1\vee 0 & 0 \vee 1 & 1 \vee 0 \\ 0 \vee 1 & 1 \vee 1 & 0 \vee 0 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

$$A \wedge B = \begin{bmatrix} 1\wedge 0 & 0 \wedge 1 & 1 \wedge 0 \\ 0 \wedge 1 & 1 \wedge 1 & 0 \wedge 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

#13. $A = \begin{bmatrix} 3 & k \\ -4 & -3 \end{bmatrix} = A^{-1}$

$$A^{-1} = \frac{1}{(3)(-3) - k(-4)} \begin{bmatrix} -3 & -k \\ 4 & 3 \end{bmatrix}$$

$$= \frac{1}{-9 + 4k} \begin{bmatrix} -3 & -k \\ 4 & 3 \end{bmatrix} = \begin{bmatrix} 3 & k \\ -4 & -3 \end{bmatrix}$$

$$\frac{-3}{-9+4k} = \frac{3}{1}$$

$$-27+12k = -3$$

$$12k = 24$$

$$k = 2$$

$$\frac{1}{-9+4(2)} = \frac{1}{-1} = -1$$

$$-1\begin{bmatrix} -3 & -(2) \\ 4 & 3 \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ -4 & -3 \end{bmatrix}$$