Nishant Jindal

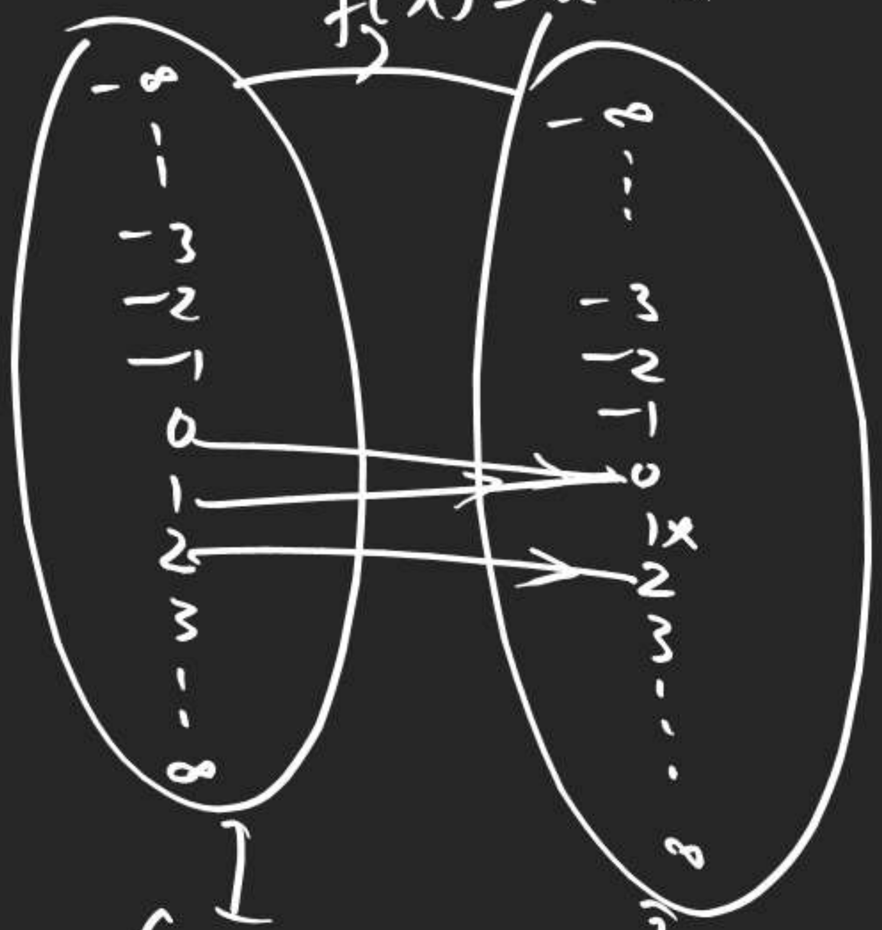
RELATION FUNCTION

$\boxed{\text{Bij}}$ = Invertible

Q1. $f: \underline{I} \to \underline{I}$ $\quad f(x) = x^2 - x$. → Mapping Method.

Check Nature?

$f(x) = x^2 - x$



I (x) $\qquad$ I.

$x^2 - x = 1$

$x^2 - x - 1 = 0$

$x = \dfrac{1 \pm \sqrt{5}}{2}$ → 1.6, → −.6

M21 + Into

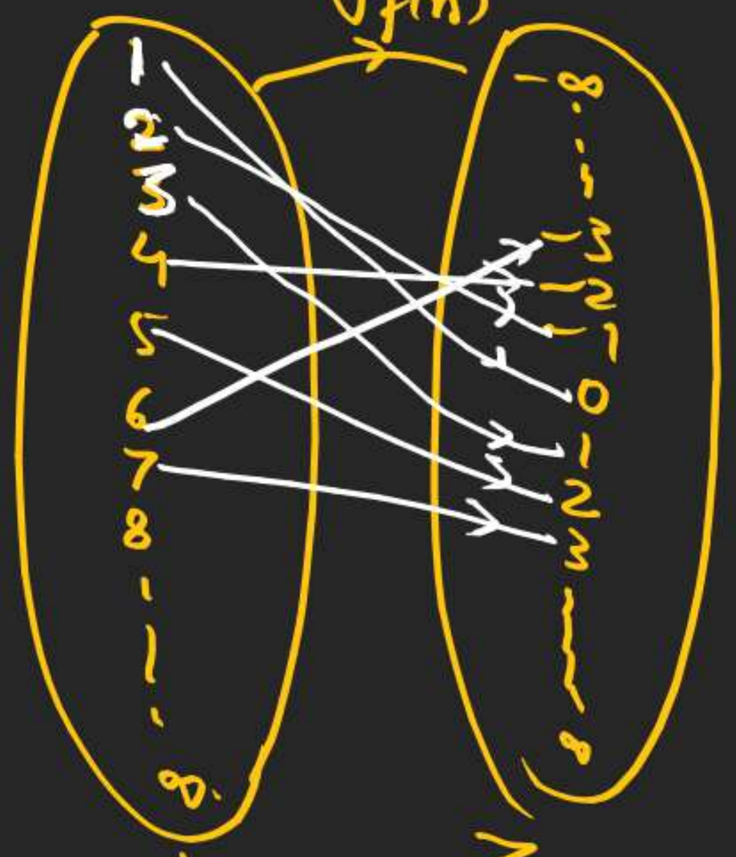
Q2 If fxn is defined from $\boxed{\text{Natural No}}$ to $\boxed{\text{Integer}}$

$$f(n) = \begin{cases} \dfrac{n-1}{2} & n = \text{odd} \\ -\dfrac{n}{2} & n = \text{Even} \end{cases}$$

$f: N \to Z$

Mapping Method

f(n)



N (n) $\qquad$ Z.

$\dfrac{1-1}{2} = 0$

$\dfrac{-2}{2} = -1$

$\dfrac{3-1}{2} = 1$

$\dfrac{-4}{2}$

$\dfrac{5-1}{2} = 2$

121 + Onto

Nishant Jindal

RELATION FUNCTION

2nd Method

(B) By Graph

1) If any Line || to x Axis cuts graph at 1 pt. only then fxn is 1 2 1 otherwise M 2 1

2) for Into & Onto fxn compare Range & B in $f: A \to B$ Codomain

3) $f: \boxed{A} \to B$

Graph Kitna Banega

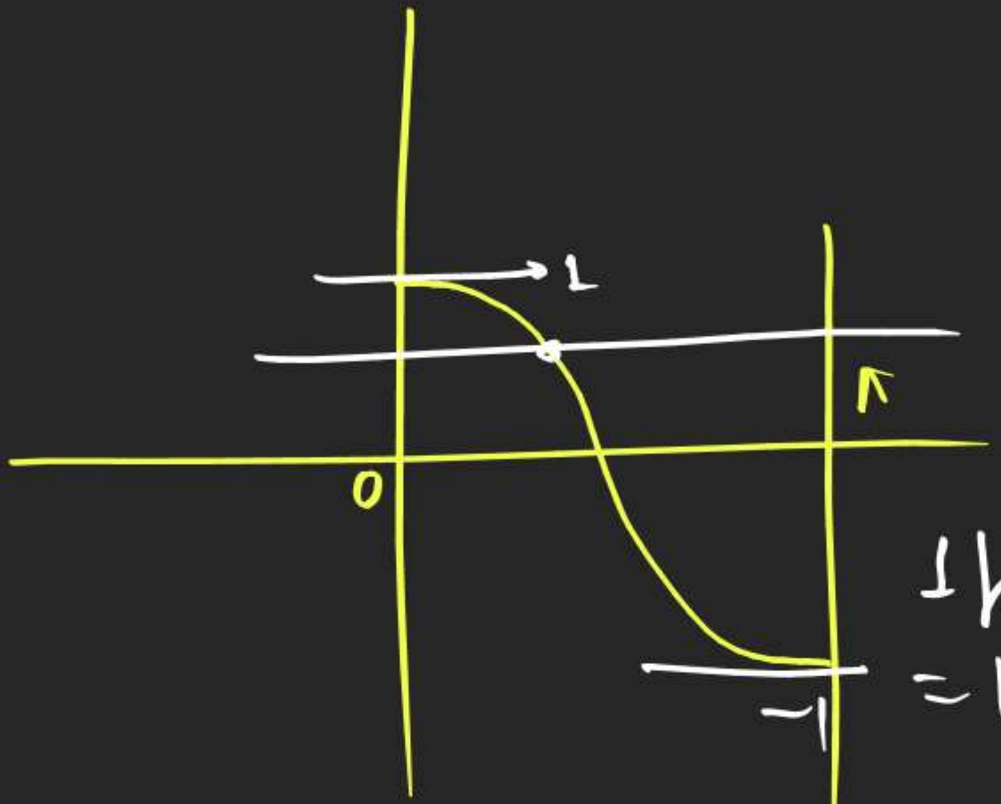
A) $f: \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \to [-1, 1]$ $f(x) = \cos x$

graph $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ me Banega

$R_f: y \in [0, 1]$
$Cod = [-1, 1]$ } Into

RELATION FUNCTION

Q $f:[0,\pi]\to[-1,1]$ $f(x)=\cos x$



1 hit
$= 1-2-1$

$R_f \in [-1,1]$
$\text{Cod} \in [-1,1]$ } Onto

Q3 $f: R\to R$ $f(x)=|x|$

$f:(-\infty,\infty)\to(-\infty,\infty)$ $f(x)=|x|$

M21

$R_f \in [0,\infty)$
$\text{Cod} \in (-\infty,\infty)$ } Into

Nishant Jindal

RELATION FUNCTION

Q $f: R^+ \to R$ $f(x) = |x|$

$f: (0,\infty) \to (-\infty,\infty)$ $f(x) = |x|$

1 Int → 1-2-1

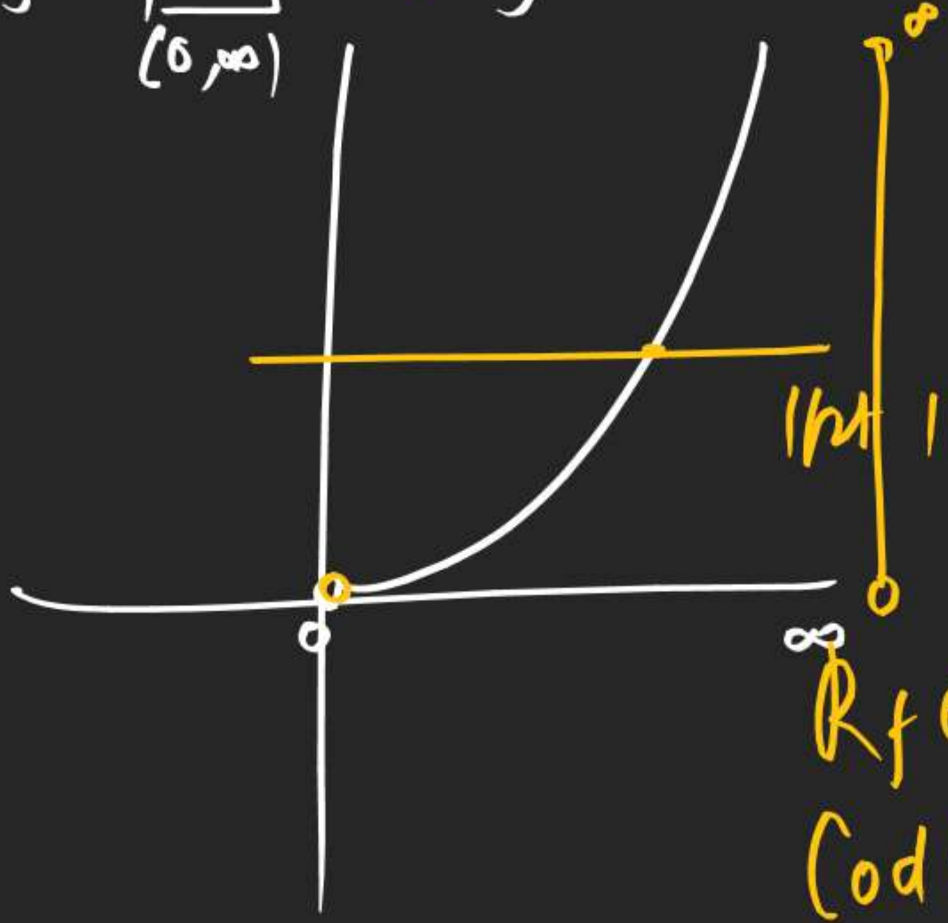
$R_f \in (0,\infty)$

$Cod \in (-\infty,\infty)$

Into.

Q_5 $f: \boxed{R^+} \to R^+$ $f(x) = x^2$

$(0,\infty)$



1 Int | 2 |

$\left.\begin{array}{l} R_f \in (0,\infty) \\ Cod \in (0,\infty) \end{array}\right\}$ Onto.

Nishant Jindal

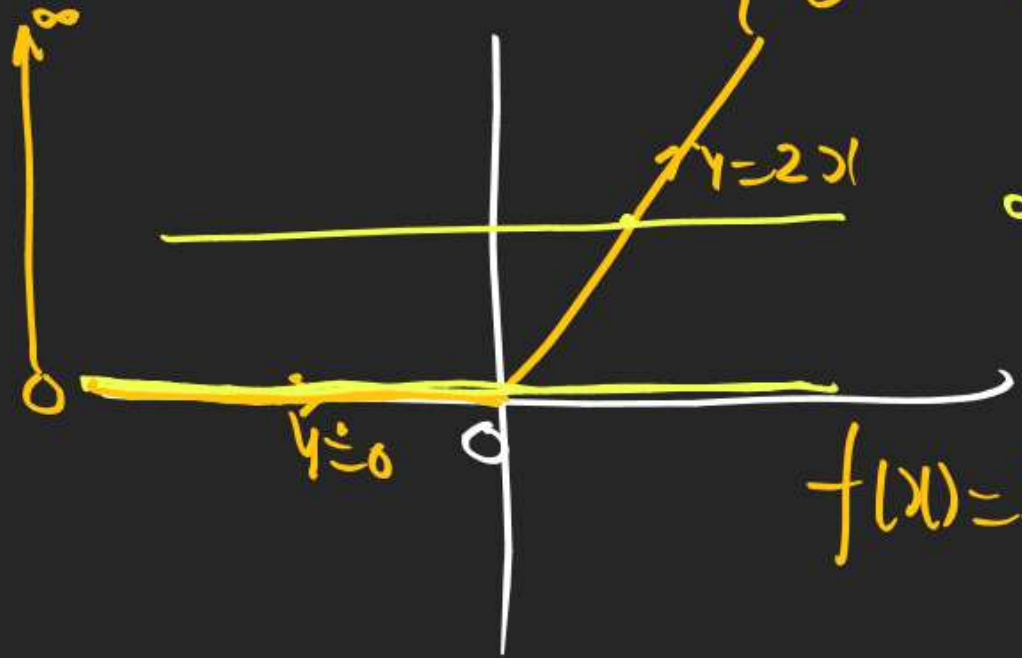
RELATION FUNCTION

Q $f: R \to R$ $f(x) = x + \sqrt{x^2}$

$f(x) = x + |x|$

$$= \begin{cases} x + x & x \geq 0 \\ x + (-x) & x < 0 \end{cases}$$

$$y = f(x) = \begin{cases} 2x & x \geq 0 \\ 0 & x < 0 \end{cases}$$



∞ pt = M21

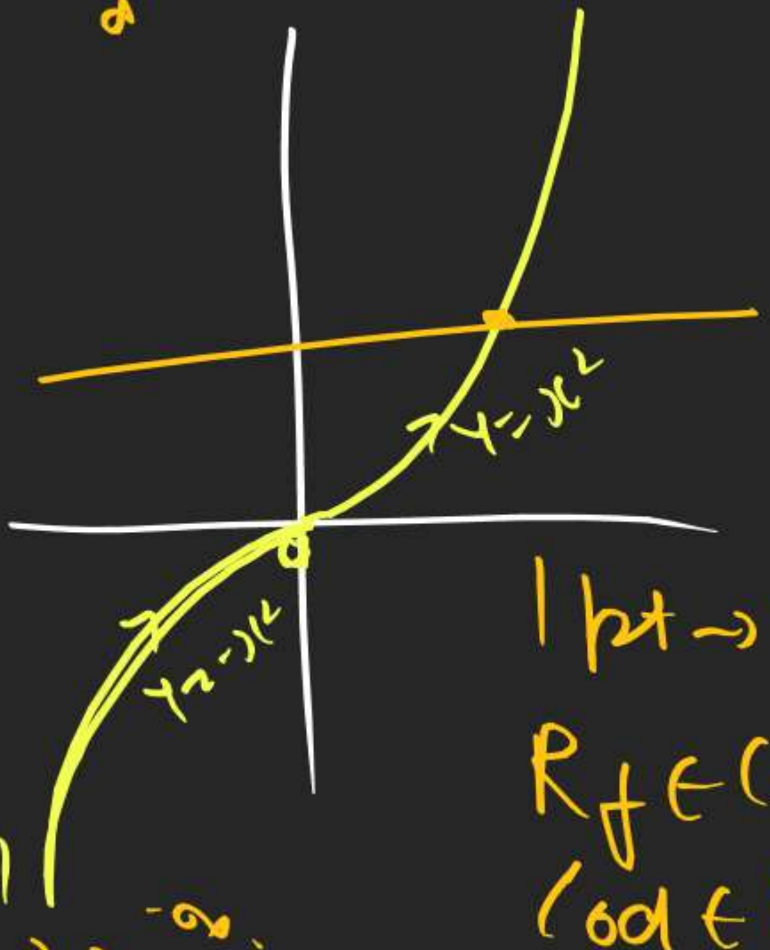
$R_f \in [0, \infty)$
$Cod \in (-\infty, \infty)$ } Into

$f(x) = x + |x|$

Q_2 $f: R \to R$ $f(x) = x|x|$ Nalun

$$= \begin{cases} x \cdot x & x \geq 0 \\ x \cdot (-x) & x < 0 \end{cases}$$

$$y = \begin{cases} x^2 & \boxed{x \geq 0} \\ -x^2 & x < 0 \end{cases}$$



1 pt → 1-2-1

$R_f \in (-\infty, \infty)$
$Cod \in (-\infty, \infty)$ } Onto

Nishant Jindal

RELATION FUNCTION

Q8 $f:[0,2] \to [2,5]$ $f(x) = 3x^2 - 6x + 5$

then $f(x)$ is - - - -

$a = 3$ ⊕ Upward

$b = -6$

$c = 5$

$f(x) = 3x^2 - 6x + 5$

$f'(x) = 6x - 6 = 0$

$x = 1$

$y = 3 \cdot 1^2 - 6 \times 1 + 5$

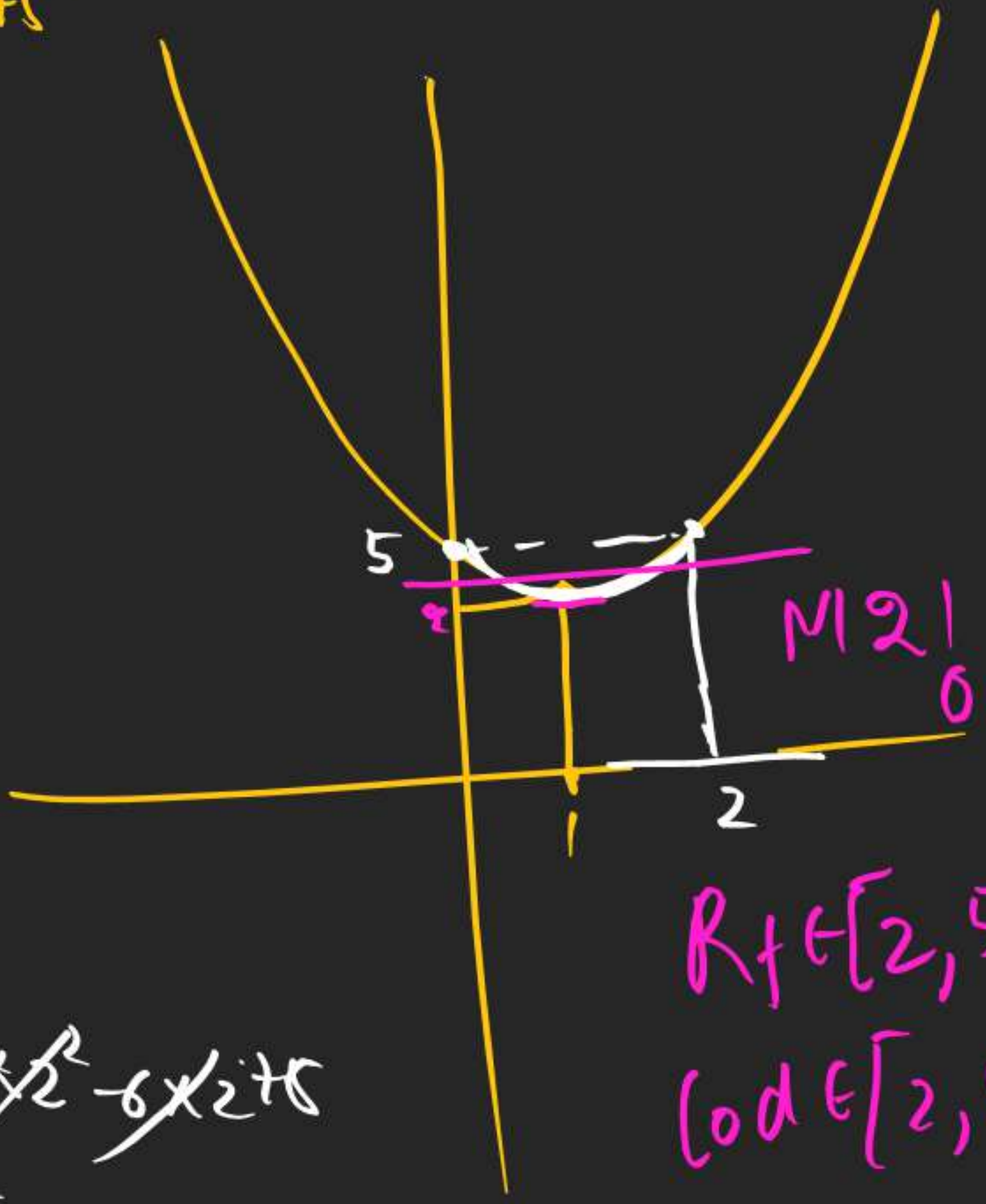
$= 2$

Vertex $(1, 2)$

$f(0) = 5$

$f(2) = 3 \times \cancel{2^2} - \cancel{6 \times 2} + 5$

$= 5$



M21

Onto

$R_f \in [2,5]$

$Cod \in [2,5]$

Nishant Jindal

RELATION FUNCTION

M3 By $\frac{dy}{dx}$

A) If $\frac{dy}{dx} > 0$ or < 0 [Confirm]

then fxn 1-2-1

B) If $\frac{dy}{dx} > 0$ या < 0 [Conditional]

then fxn M21

Q. $f(x) = x^3 + x$ $f: R \to R$

Nature?

A) $\frac{dy}{dx} = 3x^2 + 1 > 0$ [Sure] ↑ing

$\geq 0 + 1$

≥ 1

fxn 1-2-1

B) $f(x) = x^3 + x$

Odd Poly → Range = R

Cod = R

} Onto

RELATION FUNCTION

Q10 $f: R \to R,\ f(x) = 2x + \sin x$

1) $\dfrac{dy}{dx} = \{2 + \cos x\}$ +ve > 0 harhal

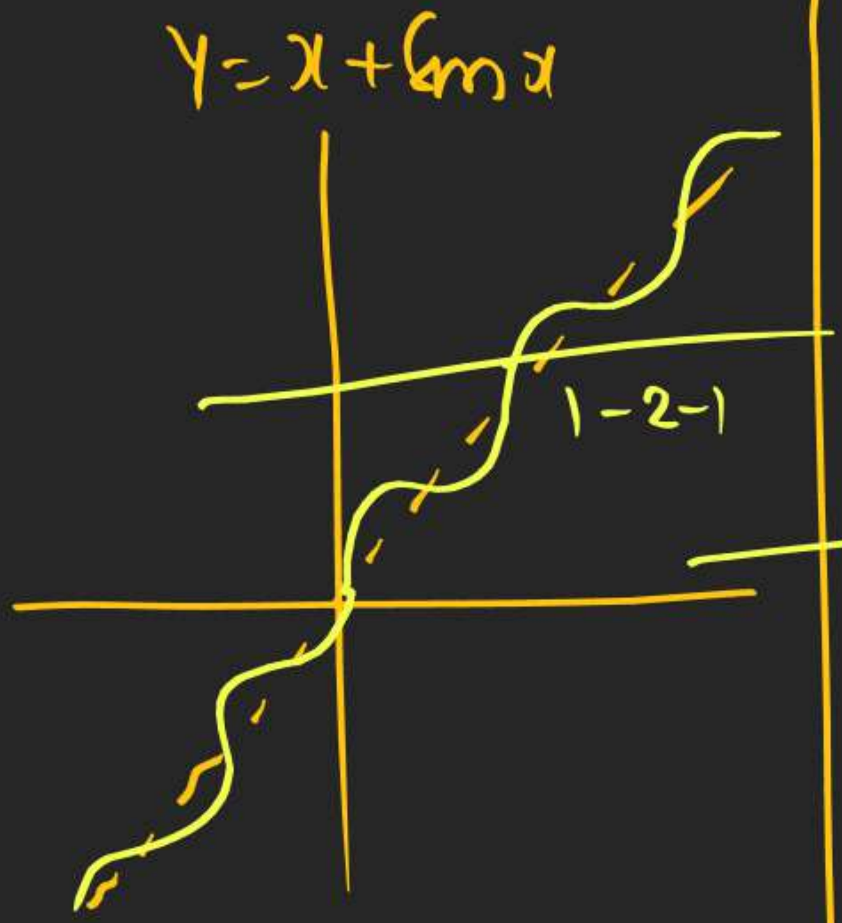
$\uparrow$ ing

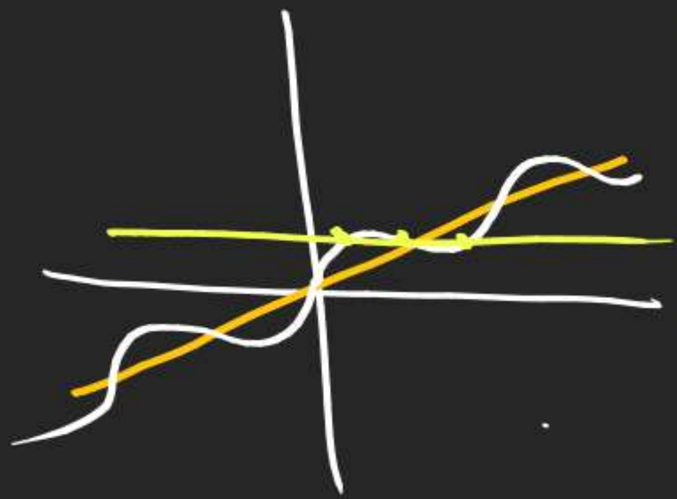
1-2-1

2) $f(x) = 2x + \sin x$

$= R \cup [-1, 1]$

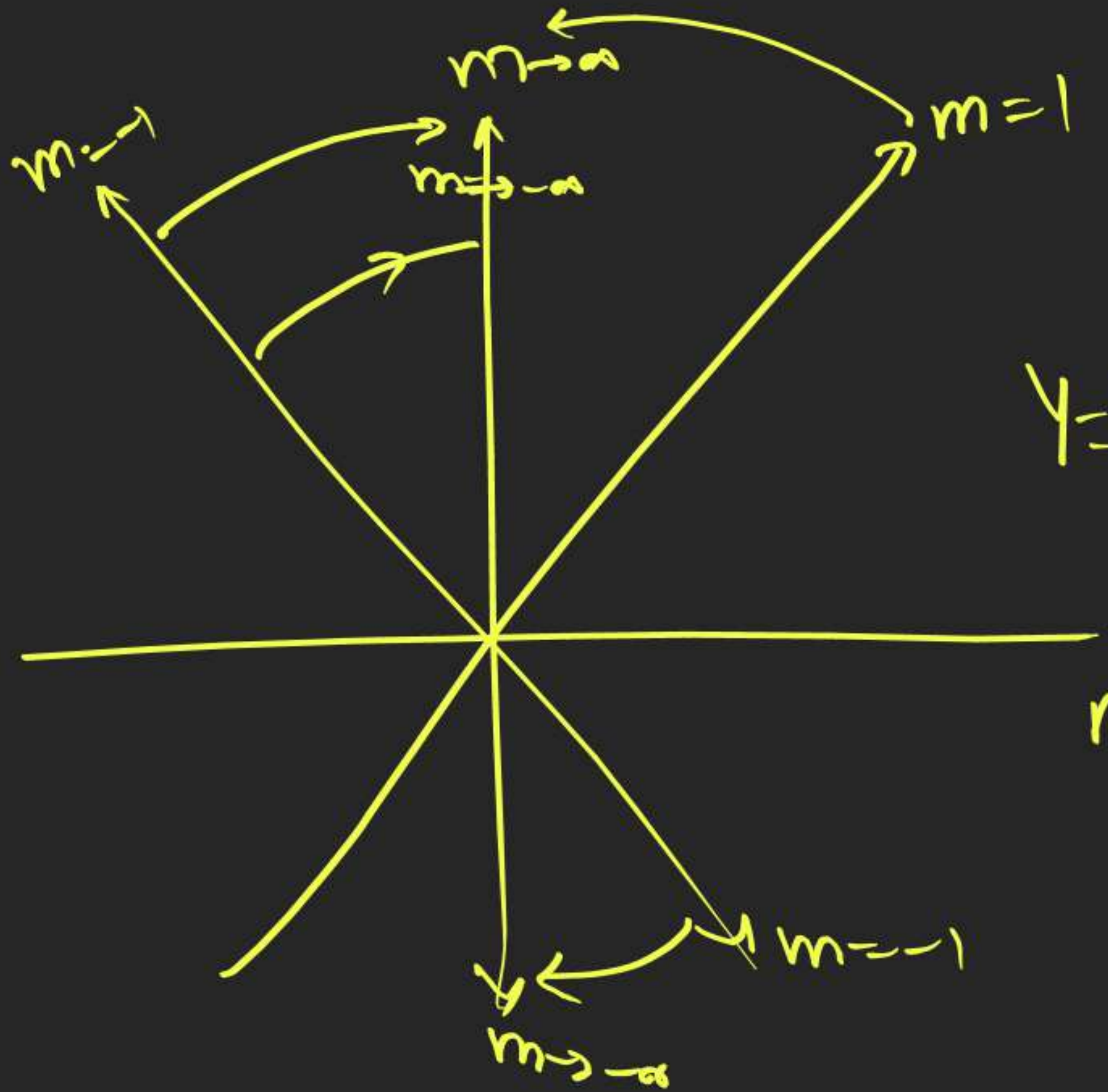
$\left.\begin{array}{l} R_f = R \\ Cod = R \end{array}\right\}$ onto





Nishant Jindal

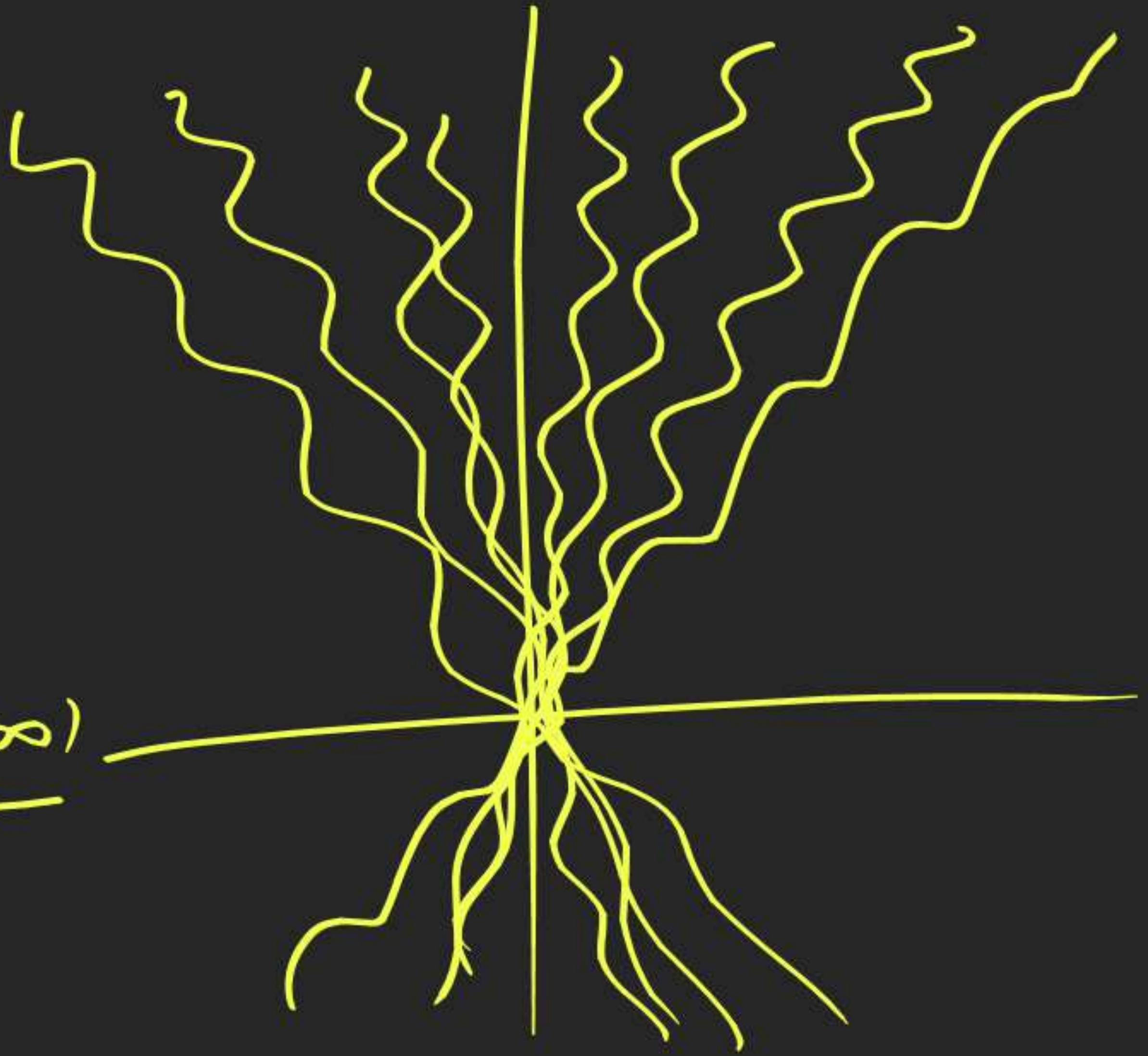
RELATION FUNCTION



$y = \boxed{m}x + \sin x$

$|m| \geq 1$

$m \in (-\infty, -1] \cup [1, \infty)$



RELATION FUNCTION

M4 NCERT Method

If $f(x_1) = f(x_2)$ Assumed

& it gives $\rightarrow x_1 = x_2$ then fxn is 1-2-1

Q $f: R - \{-3\} \rightarrow R - \{1\}$, $f(x) = \frac{x-1}{x+3}$ Nature?

① let $f(x_1) = f(x_2)$

$$\frac{x_1 - 1}{x_1 + 3} = \frac{x_2 - 1}{x_2 + 3}$$

$$\cancel{x_1 x_2} - x_2 + 3x_1 - \cancel{3} = \cancel{x_1 x_2} + 3x_2 - x_1 - \cancel{3}$$

$$4x_1 = 4x_2$$

$$x_1 = x_2 \rightarrow \boxed{1-2-1}$$

② $f(x) = \frac{1 \cdot x - 1}{1 \cdot x + 3}$ R_f $Y \in R - \left\{\frac{1}{1}\right\}$

$Y \in \boxed{R - \{1\}}$

$\boxed{\text{onto}}$ cod $= \boxed{R - \{1\}}$

RELATION FUNCTION

Q. $f(x) = \dfrac{x}{1+x^2}$ 1-2-1 / M-2-1?

let $f(x_1) = f(x_2)$

$$\frac{x_1}{1+x_1^2} = \frac{x_2}{1+x_2^2}$$

$$x_1 + x_1x_2^2 = x_2 + x_1^2x_2$$

$$(x_1 - x_2) + x_1x_2(x_2 - x_1) = 0$$

$$(x_1 - x_2)\{1 - x_1x_2\} = 0$$

$\boxed{x_1 = x_2}$ OR $\to x_1x_2 = 1$

$\boxed{x_2 = \dfrac{1}{x_1}}$

M21

$f: R \to R$

Q $f(x) = \dfrac{1}{1+\sqrt{x}}$ M21 / 1-2-1?

13

$f(x_1) = f(x_2)$ (let).

$$\frac{1}{1+\sqrt{x_1}} = \frac{1}{1+\sqrt{x_2}}$$

$$\cancel{1} + \sqrt{x_1} = \cancel{1} + \sqrt{x_2}$$

$x_1 = x_2 \to$ 1-2-1

$f(x) = \dfrac{1}{1+\sqrt{x}}$ (+) (+)

$Y = \dfrac{+}{+} = +ve$

Above X Axis

Into

Range $\subset$ R

Range ≠ Cod.

Nishant Jindal

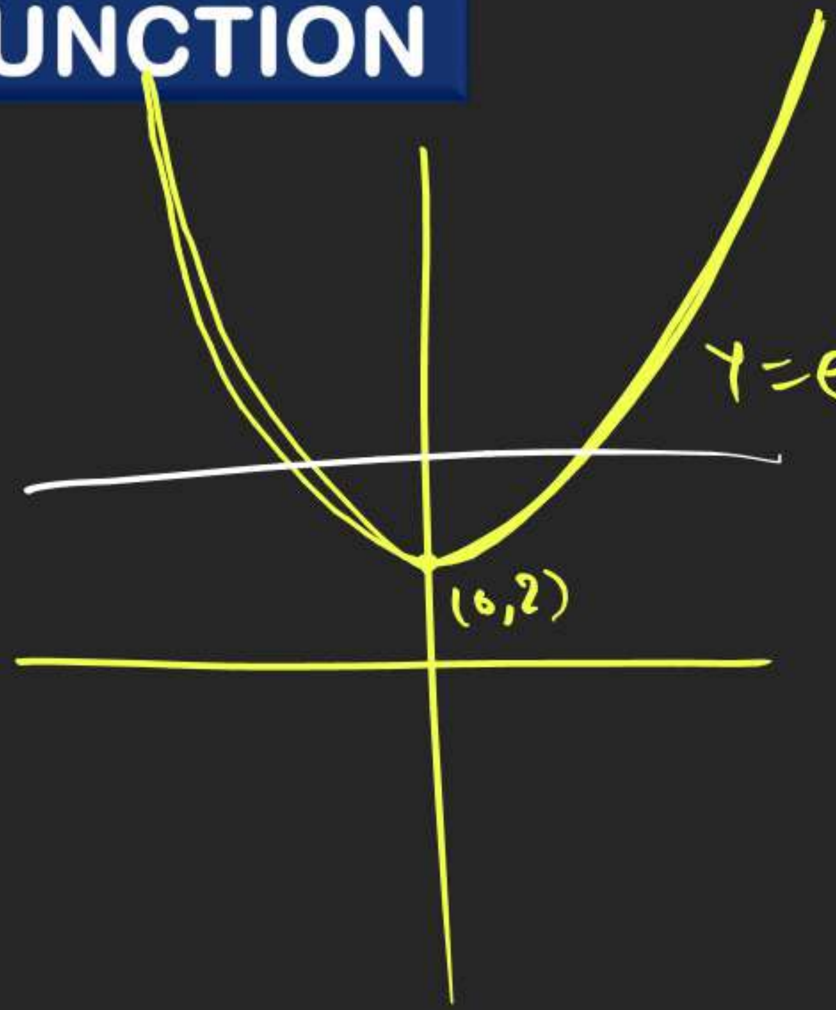
RELATION FUNCTION

MS → A) Even fxn is always M21.

B) Periodic fxn is always M-2-1

Even fxn → $f(-x) = f(x)$

→ graph Symm Abt Y Axis



M21

$y = 2^{x} + 2^{-x}$

A) $f(x) = e^{x} + e^{-x}$

$f(0) = e^{0} + e^{-0} = 1 + 1 = 2$

$f(-x) = e^{-x} + e^{x} = f(x)$

Even

$\frac{dy}{dx} = e^{x} - e^{-x} = e^{x} - \frac{1}{e^{x}} = \frac{e^{2x} - 1}{e^{x}}$

0 → $\frac{e^{0} - 1}{e^{0}} = 0$

1 → $\frac{e^{2} - 1}{e} = \frac{7.8 - 1}{2.7}$ +

Nishant Jindal

RELATION FUNCTION

Q14. $f(x) = \dfrac{2x^2 - x + 5}{7x^2 + 2x + 10}$ $f: R \to R$

Nature?

Hr Vo qs Jo $\dfrac{Q}{Q}$ ho

Use Aise hi try Kro

$$f(x) = \frac{2x^2 - x + 5}{7x^2 + 2x + 10}$$

→ $D = 1 - 40 = -ve$

→ $D = 4 - 280 = -ve$

$Y = \dfrac{+}{+} = +ve$ → Above X Axis graph

Range $\neq R$

$\neq$ cod → Into

A) f xn ko 0 Dalo.

$f(0) = \dfrac{5}{10} = \dfrac{1}{2}$

B) $\dfrac{1}{2}$ U tha Kr f(x) K Samne Rakho

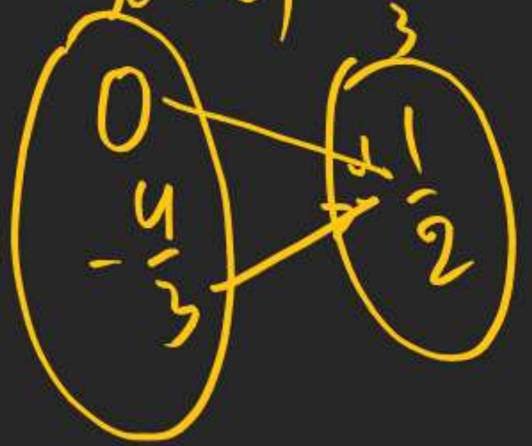
$$\frac{1}{2} = \frac{2x^2 - x + 5}{7x^2 + 2x + 10}$$

$$7x^2 + 2x + \cancel{10} = 4x^2 - 2x + \cancel{10}$$

$$3x^2 + 4x = 0$$

$$x(3x + 4) = 0$$

$$x = 0, -\frac{4}{3}$$



M21

Nishant Jindal

RELATION FUNCTION

Samechiz Samemese ghategi

Q15 $f, g : R \to R$.

$$f(x) = \begin{cases} x+3 & x \in Q \\ 4x & x \in Q' \end{cases} \qquad g(x) = \begin{cases} x+\sqrt{5} & x \in Q' \\ -x & x \in Q \end{cases}$$

$$(f-g)x = ?$$

$$f(x) - g(x) = \begin{cases} 2x+3 & \boxed{x \in Q} \\ \boxed{3x - \sqrt{5}} & x \in Q' \end{cases}$$

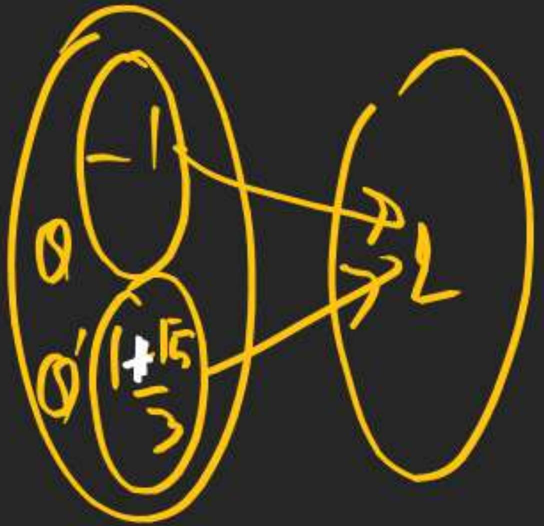
$3x - \sqrt{5} = -\sqrt{5}$

$x = 0 \notin Q'$

Into

$3x - \sqrt{5} = 1$

$x = \dfrac{1+\sqrt{5}}{3}$



$$\underset{Q}{f(-1)} = 1 = \underset{Q'}{f\left(\frac{1+\sqrt{5}}{3}\right)}$$

M21

Nishant Jindal

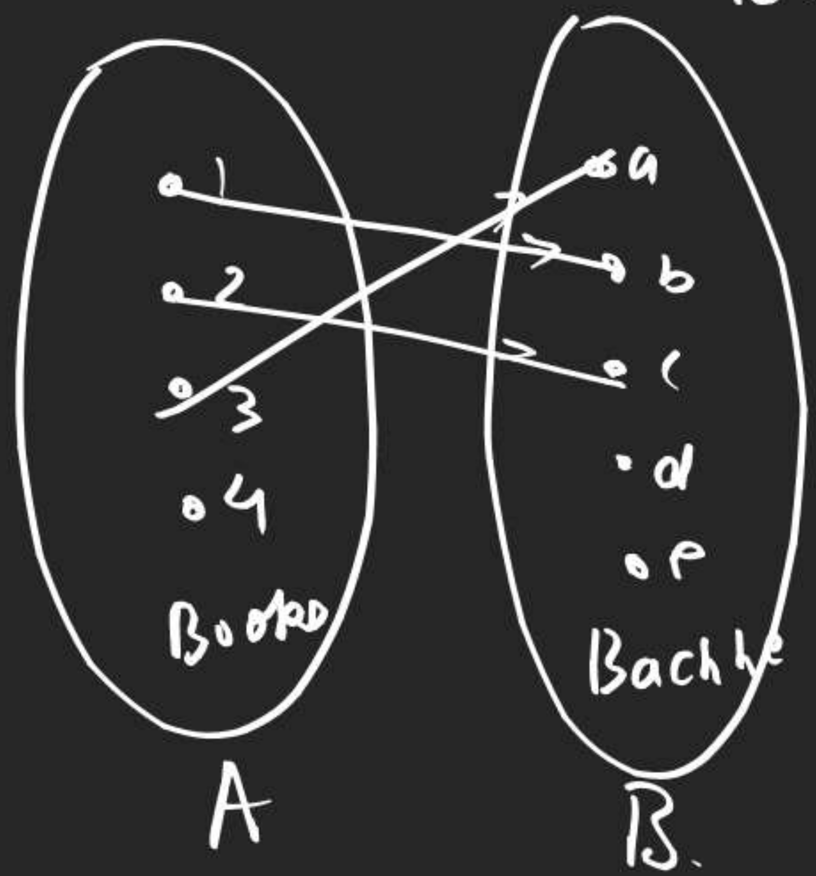
RELATION FUNCTION

No of Kinds of fxn.

$A=\{1,2,3,4\}$ $n(A)=4$

$B=\{a,b,c,d,e\}$ $n(B)=5$

(1)



A) No. of Total fxn $= 5\times5\times5\times5 = 5^4 = 625$

B) No of 1-2-1 fxn $= 5\times4\times3\times2 = \boxed{120}$

C) No. of M21 fxn $= 625-120 = 505$

(D) No of Onto fxn = 4 Books to be distributed if each child get at least one

$= 0 \quad (n(A) < n(B))$

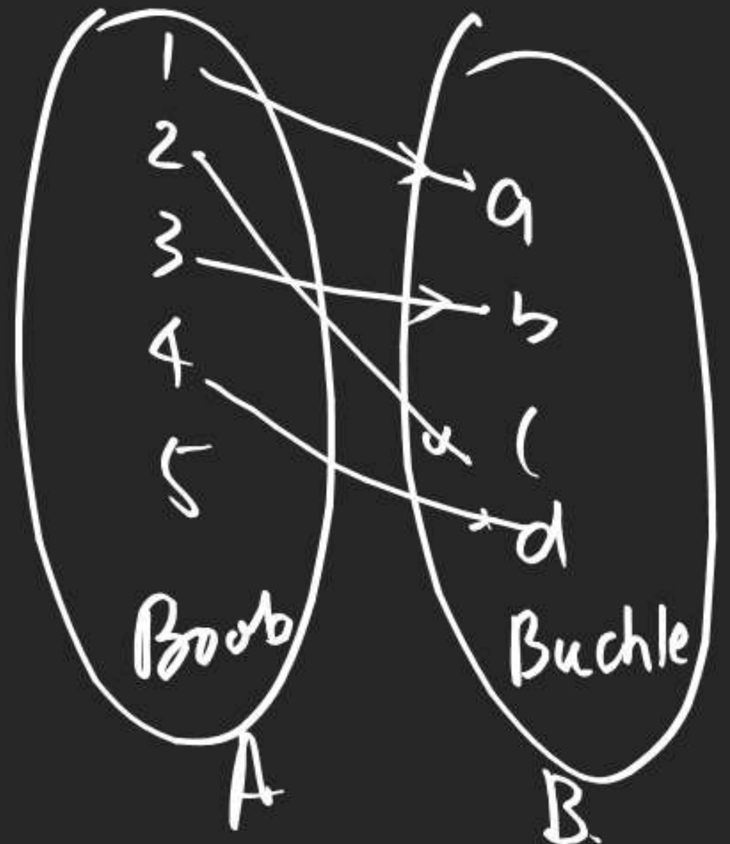
(E) No of Into fxn $= 620-0 = 625$

Nishant Jindal

RELATION FUNCTION

(2) $A=\{1,2,3,4,5\}$

$B=\{a,b,c,d\}$



A) No of total fxn $=4\times4\times4\times4\times4=4^5=1024$

B) No of 1-2-1 fxn $=4\times3\times2\times1\times0=0$ $(n(A)>n(B))$

C) No of M21 fxn $=1024-0=1024$

D) No of Onto fxn = No of ways of distributing 5 Books in 4 students

$5 \to 1, 1, 1, 2$

$$=\underbrace{\left\{\frac{\cancel{5!}^{\,60}}{1!\,1!\,1!\,\cancel{2!}}\times\frac{1}{\cancel{3!}}\right\}}_{\text{No of division}}\times\underbrace{\cancel{4!}^{\,4}}_{\text{Dist}}=240$$

No of Into $=1024-240$