De morgan's law:

for 3 non-empty sets A, B & C,
De morgan's law shows the compliment of diferent operators such as $\boxed{(A \cup B)^c = A^c \cap B^c}$
and $\boxed{(A \cap B)^c = A^c \cup B^c}$

proof: $y \in (A \cup B)^c$
$\rightarrow y \notin (A \cup B)$
$\rightarrow y \notin A$ and $y \notin B$.
$\rightarrow y \in A'$ and $y \in B'$
$\rightarrow y \in A' \cap B'$ —(i)

$z \in A' \cap B'$
$\rightarrow z \in A'$ and $z \in B'$
$\rightarrow z \notin A$ and $z \notin B$.
$\rightarrow z \notin (A \cup B)$
$\rightarrow z \in (A \cup B)'$ —(ii)

from (i) & (ii) proofed, ~~Af~~ $(A \cup B)^c = A^c \cap B^c$

10/1/25 **Product**

A, B two non empty sets.

$$A \times B = \{ (x, y) : x \in A \text{ and } y \in B \}$$

$$B \times A = \{ (y, x) : x \in A \text{ and } y \in B \}$$

$A \times B$ and $B \times A$ are not equal all time.
if $A \times B = B \times A$ then $A = B$.

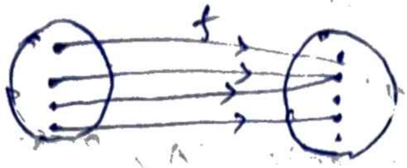
n non empty sets $A_1, A_2, A_3 \ldots$)
then their cartesian product will have n- tuple.

$$A_1 \times A_2 \times \ldots \times A_n$$

$$= \{ (x_1, x_2, \ldots x_n) : x_1 \in A_1, x_2 \in A_2 \ldots x_n \in A_n \}$$

Function: f

Every element of A will be mapped in single element of B.

A  B

$f(x) = \sqrt{x}$ not function

one to one $\boxed{\checkmark}$

many to one $\boxed{\checkmark}$

one to many $\boxed{\times}$

Relation:

Let A and B are two non-empty sets then any subsets of $A \times B$ is a relation from A into B.

Properties:-

① Reflexive: For 2 non empty sets A & B, a Reflexive property holds if and only if the subset R contains elements, $R = \{(a, a) : a \in A, a \in B\}$

if we take a single set A containing ~~the~~ some elements then the relation R from A into A, $R = \{(a, a) : a \in A\}$

② symmetric: For 2 non empty sets A & B, Relation R will be symmetric if $(a, b) \in \mathbb{R}$

$(b, a) \in \mathbb{R}$

1,2. 2,1

2,2.

③ Transitive: For 2 non-empty sets A & B, the relation R will be transitive when

$(a,b) \in \mathbb{R}$ and $(b,c) \in \mathbb{R}$
$\Rightarrow (a,c) \in \mathbb{R}$

Q.
let $\mathbb{R}$ = set of Rean number
let ρ be any relation defined on it such that, ρ = A, B

$\rho = \{(a,b) : a \in \mathbb{R}, b \in \mathbb{R}, a-b$ is int
check whether it is equivalence relation or not. [If a relation, Reflexive, symmetric, transitive, its called equivalence relation]