Unit-1

Mathematical Logic

Proposition / statement : → Statement that is either true or false.

Ex:- i) I will play.
ii) Delhi is the ~~capi~~ capital of India.

Non- proposition :

Ex:- i) what is your name?
ii) what is the time now?

Q1. "$x+1=2$". Is this a preposition?

⇒ No., $x=1$ then it is true, but if $x \neq 1$ then it is false.

So, this ~~is~~ is not a proposition, this is predecate.

Propositional Variable — It is a small variable or notation to represent statement.

Ex:- p : "I will play cricket"

Proposition
- Primitive
- Compound

p: "I will play cricket".

I will play cricket and football.

p: I will play cricket
q: I will play football.
} and

"p and q". {and is the connector}.

Negation ($\sim$ / $-$ / $\bar{\ }$ / $'$) ÷ Let p be a proposition, The negation of p, denoted by $\sim p$. ($\sim p$, $-p$, p', Np, $!p$)

Ex p: 'I will eat rice'.

$\sim p$: 'I will not eat rice'.

We can write negation of p as

$\sim p, -p, \bar{p}, p'$.

Conjunction. (AND) ($\wedge$) $\rightarrow$ Let p and q be two proposition, then "p and q" is written as "$p \wedge q$".

Ex " I will eat pizza and icecream".

How many prepositions are there?
$\rightarrow 2$

p: I will eat pizza AND q: I will eat icecream.

$\boxed{'p \wedge q'}$.

Disconjunction (OR) ($\vee$) $\rightarrow$ Let p and q be two proposition, then 'p or q' is written as 'p or q'.

" I will eat pizza or icecream".

p: "I will eat pizza" OR q: 'I will eat icecream".

$\boxed{p \vee q}$.

... Let p and q be propositions. The exclusive of p and q denoted by $p \oplus q$ (or p XOR q). is the proposition that is true when exactly one of p and q is true and is false otherwise.

Ex: p: A student can have a salad with dinner, q: A student can have soup with dinner".

$(p \oplus q)$:

Ex:- " I will neither eat pizza nor roti" ∮.

(a) $p \vee \sim q$ (b) $\sim p \vee \sim q$ (c) $\sim p \wedge \sim q$

(d) $\sim p \vee q$ (e) None.

Ans → I will not eat pizza and I will not eat icecream

$\sim p$ $\sim q$

$\boxed{\sim p \wedge \sim q}$.

Truth table.

1) Negation ($\sim$)

1 Variable.

Input = p , Output = $\sim p$.

Truth table.

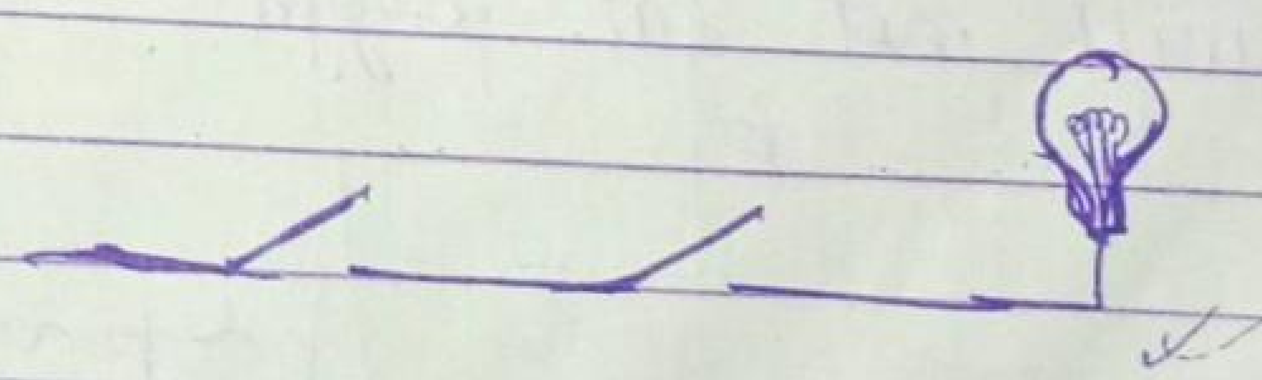
p	$\sim p$
T	F
F	T

2) Conjunction ($\wedge$)

2 Variable

Input = p, q Output = '$p \wedge q$'

p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F



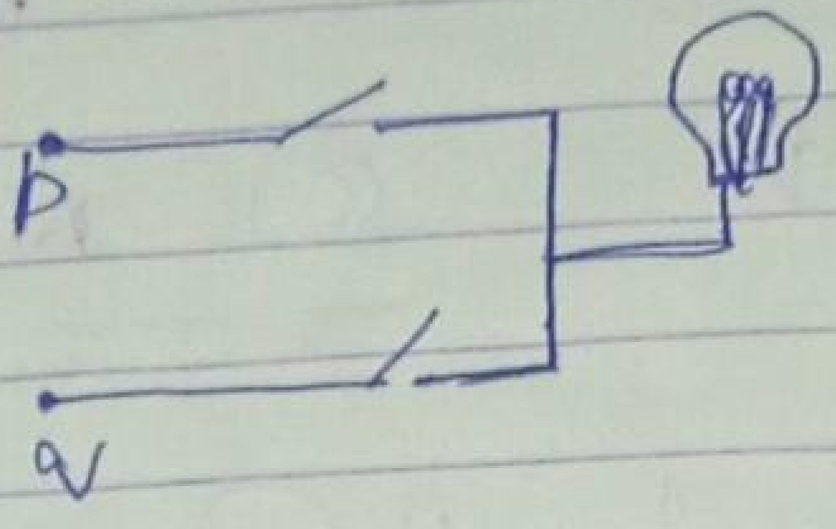
Exclusive Input - p, q Output - p ⊕ q

p	q	$p \oplus q$
T	T	F
T	F	T
F	T	T
F	F	F

Disjunction

Input = p, q Output = $p \vee q$.

P	q	$p \vee q$
T	T	T
T	F	T
F	F	F
F	T	T



Practice

Q1 What is the logical expression of.

" I will either go to play or go to market".

(a) $\sim p \wedge \sim q$ (b) $\sim p \vee q$ (c) $p \vee q$ (d) $p \wedge q$ (e) No

$\Rightarrow$ I will go to play (p) or ($\vee$) I will go to market (q).

$\boxed{p \vee q}$

Q2 " I will neither eat pizza nor icecream".

(a) $\sim p \vee q$ (b) $\sim p \wedge q$ (c) $p \wedge q$ (d) $\sim p \wedge \sim q$ (e) Non-

I will not eat pizza ($\sim p$) and ($\wedge$) I will not eat icecream ($\sim q$).

$\boxed{\sim p \wedge \sim q}$.

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Conditional Statement / Implication ($\longrightarrow$) : Let

p and q are preposition. The conditional statement $p \to q$ is the proposition "If p then q".

Ex:- If you play then I will play

$$\underbrace{\text{you play}}_{p} \longrightarrow \underbrace{\text{I will play}}_{q}$$

p – hypothesis
q – conclusion

$(p \to q) \to \{\text{If } p \text{ then } q\}$.

Q3. "If you play cricket, I will play cricket and football."

(a) $p \to q$ (b) $p \to q \vee r$ (c) $p \to (q \wedge r)$ (d) $\sim p \to (q \wedge r)$ (e) None.

Solution :- p: You play cricket

q: I will play cricket and r: I will play football.

$p \to (q \wedge r)$.

Truth table of $p \to q$.

Input : p, q Output $p \to q$

p	q	$p \to q$	$q \to p$
T	T	T	T
T	F	F	T
F	T	T	F
F	F	T	T

Note :- $p \to q$ is only false if $p = T$ & $q = F$
or
$q \to p$ is only false if $q = T$ & $p = F$.

Biconditional statement ($\leftrightarrow$)

(if and only if) / necessary and sufficient condition.
(iff.)

Ex:- $\underbrace{\text{I will play}}_{p}$ iff $\underbrace{\text{you will play}}_{q}$;

$p \longleftrightarrow q$

$$\boxed{p \leftrightarrow q}$$

Truth table

Input : p, q   Output $p \leftrightarrow q$.

p	q	$p \leftrightarrow q$	$p \rightarrow q$
T	T	T	T
T	F	F	F
F	T	F	T
F	F	T	T

{Here q is independent}

✱ In biconditional, both p, and q promising each other.

✱

Ex. $p \rightarrow (q \wedge r)$.
what is the truth table of.

p	q	r	$q \wedge r$	$p \rightarrow (q \wedge r)$
T	T	T	T	T
T	T	F	F	F
T	F	T	F	F
T	F	F	F	F
F	T	T	T	T
F	T	F	F	T
F	F	T	F	T
F	F	F	F	T

Q Find the truth table of $(p \vee \sim q) \rightarrow (p \wedge q)$

p	q	$\sim q$	$p \vee \sim q$	$p \wedge q$	$(p \vee \sim q) \rightarrow (p \wedge q)$
T	T	F	T	T	T
T	F	T	T	F	F
F	T	F	F	F	T
F	F	T	T	F	F

$\boxed{0}$ Bit String [Combination of 0 and 1]

$a \rightarrow 10110111$
$b \rightarrow 01110001$

$T \rightarrow 1$
$F \rightarrow 0$

What is bitwise OR?

$$\begin{array}{rl} a \rightarrow & 1\ 0\ 1\ 1\ 0\ 1\ 1\ 1 \\ b \rightarrow & 0\ 1\ 1\ 1\ 0\ 0\ 0\ 1 \\ \hline (a \vee b)\ \text{OR} & 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1 \end{array}$$

$$\begin{array}{rl} a - & 1\ 0\ 1\ 1\ 0\ 1\ 1\ 1 \\ b \rightarrow & 0\ 1\ 1\ 1\ 0\ 0\ 0\ 1 \\ \hline (a \wedge b) & 0\ 0\ 1\ 1\ 0\ 0\ 0\ 1 \end{array}$$

$$\begin{array}{rl} a \rightarrow & 1\ 0\ 1\ 1\ 0\ 1\ 1\ 1 \\ b \rightarrow & 0\ 1\ 1\ 1\ 0\ 0\ 0\ 1 \\ \hline a \leftrightarrow b & 0\ 0\ 1\ 1\ 1\ 0\ 0\ 1 \end{array}$$

Table for bit operator OR, AND and XOR.

p	q	$p \vee q$	$p \wedge q$	$p \oplus q$
0	0	0	0	0
0	1	1	0	1
1	0	1	0	1
1	1	1	1	0

Q What is the logical expression of the following sentence.

a) " you cannot ride the roller coaster if you are under 4 feet tall unless you are older than 16 years old".

a) $p \rightarrow (q \wedge r)$ (b) $p \rightarrow (\sim q \wedge r)$ c) $(q \wedge \sim r) \rightarrow \sim p$

(d) $(\sim q \wedge \sim q) \rightarrow \sim p$. (e) None.

→ If you are ~~not~~ 16 years old then you cannot ride the roller coaster.

q $\wedge$ $(\sim r)$

If you are under 4 feet tall and you are not ~~de~~ older than 16 years then you cannot ride the roller coaster.

$\sim p$.

$$\boxed{(q \wedge \sim r) \rightarrow \sim p}$$

Logical Equivalence

⇒ Two proposition: 'a' ~~and~~ 'b'

Truth table = Truth table

i.e; if truth table of both expression are same, then it known as logical equivalence.

Basic Properties

Equivalence	Name
1. a) $p \wedge T \equiv p$	Identity law
b) $p \vee F \equiv p$	
2. a) $p \vee T \equiv T$ $p \wedge F \equiv F$	Domination laws
3. a) $p \vee p \equiv p$ b) $p \vee p \equiv p$	Idempotent law
4. $\sim(\sim p) \equiv p$	Double negation law
5. $p \vee q \equiv q \vee p$ $p \wedge q \equiv q \wedge p$	Commutative laws
6. $(p \vee q) \vee r \equiv p \vee (q \vee r)$ $(p \wedge q) \wedge r \equiv p \wedge (q \wedge r)$	Associative law
~~7. $p \vee (q \vee r) \equiv p \vee (q \vee r)$~~ ~~$(p \wedge q) \wedge r = p \wedge (q \wedge r)$~~	|
(7) $p \vee (q \vee r) \equiv (p \vee q) \wedge (p \vee r)$ $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$	Distributive law.
(8) $\sim(p \wedge q) \equiv \sim p \vee \sim q$ $\sim(p \vee q) = \sim p \wedge \sim q$	Demorgan's law.
(9) $p \vee (p \wedge q) \equiv p$ $p \wedge (p \vee q) \equiv p$	Absorption law.

(10) $p \vee \sim p \equiv T$
$p \wedge \sim p \equiv F$

Proofs:

① $p \wedge T \equiv p$

p	T	$p \wedge T$
T	T	T
F	T	F

(2) $p \vee F \equiv p$

p	F	$p \vee F$
T	F	T
F	F	F

(3) $p \vee T \equiv T$

p	T	$p \vee T$
T	T	T
F	T	T

(4) $p \wedge F \equiv F$

p	F	$p \wedge F$
T	F	F
F	F	F

⑤ $\sim(\sim p) \equiv p$

p	$\sim p$	$\sim(\sim p)$
T	F	T
F	T	F

⑥ $p \vee q \equiv q \vee p$

p	q	$p \vee q$	$q \vee p$
T	T	T	T
T	F	T	T
F	T	T	T
F	F	F	F

$m = 2^n$

(7) $(p \wedge q) \equiv (q \wedge p)$

p	q	$p \wedge q$	$q \wedge p$
T	T	T	T
T	F	F	F
F	T	F	F
F	F	F	F

(8) $(p \vee q) \vee r \equiv p \vee (q \vee r)$

p	q	r	$p \vee q$	$q \vee r$	$(p \vee q) \vee r$	$p \vee (q \vee r)$
T	T	T	T	T	T	T
T	T	F	T	T	T	T
T	F	T	T	T	T	T
T	F	F	T	F	T	T
F	T	T	T	T	T	T
F	T	F	T	T	T	T
F	F	T	F	T	T	T
F	F	F	F	F	F	F

Logical Equivalences involving conditional statement

1) $p \rightarrow q \equiv \sim p \vee q$

2) $p \rightarrow q \equiv \sim q \rightarrow \sim p$

3) $p \vee q \equiv \sim p \rightarrow q$

4) $p \wedge q \equiv \sim (p \rightarrow \sim q)$

5) $(p \rightarrow q) \wedge (p \rightarrow r) \equiv p \rightarrow (q \wedge r)$

6) $(p \rightarrow r) \wedge (q \rightarrow r) \equiv (p \vee q) \rightarrow r$

7) $(p \rightarrow q) \vee (p \rightarrow r) \equiv p \rightarrow (q \vee r)$

8) $(p \rightarrow r) \vee (q \rightarrow r) \equiv (p \wedge q) \rightarrow r$.

Logical Equivalences involving Biconditional statements.

1. $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$

2. $p \leftrightarrow q \equiv \sim p \leftrightarrow \sim q$

3. $p \leftrightarrow q \equiv (p \wedge q) \vee (\sim p \wedge \sim q)$

4. $\sim (p \leftrightarrow q) \equiv p \leftrightarrow \sim q$

Tautology.

Ex:- $(p \wedge q) \rightarrow (p \vee q)$

All output are True

Truth table

p	q	$p \wedge q$	$p \vee q$	$(p \wedge q) \rightarrow (p \vee q)$
T	T	T	T	T
T	F	F	T	T
F	T	F	T	T
F	F	F	F	T

So, $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.

Contradiction

— All output are false

Ex $(p \wedge \sim p)$

p	$\sim p$	$p \wedge \sim p$
T	F	F
F	T	F

So, $p \wedge \sim p$ is a contradiction

Contigency

— Neither tautology nor contradiction

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Ex:- $(p \wedge q) \longrightarrow (p \vee q)$

p	q	$p \wedge q$	$p \vee q$	$(p \wedge q) \rightarrow (p \vee q)$
T	T	T	T	T
T	F	F	T	T
F	T	F	T	T
F	F	F	F	T

So, $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.

<u>without truth table</u>

$$\underbrace{(p \wedge q)}_{a} \rightarrow \underbrace{p \vee q}_{b}$$

{ Formula
$p \rightarrow q = \sim p \vee q$

$$\begin{aligned}
a \rightarrow b &\equiv \sim a \vee b \\
&\equiv \sim (p \wedge q) \vee (p \vee q) \\
&\equiv (\sim p \vee \sim q) \vee (p \vee q) \\
&\equiv (\sim q \vee \sim p) \vee (p \vee q) \\
&\equiv \sim q \vee (\sim p \vee p) \vee q \\
&\equiv \sim q \vee (T \vee q) \\
&\equiv \sim q \vee T \\
&\equiv T
\end{aligned}$$

or.
$$\begin{aligned}
&= \underbrace{(\sim q \vee q)}_{T} \vee \underbrace{(\sim p \vee p)}_{T} \\
&\equiv T \vee T \\
&\equiv T
\end{aligned}$$

NOTE:
$p \rightarrow q \equiv -p \vee q$

Q. $(p \rightarrow q) \longleftrightarrow (-p \vee q)$ Truth table.

(a) TTFF (b) TFTF (c) TTTT (d) FFFF

Imp:

Property: If A and B are two compound propositions and $A \equiv B$, then $A \leftrightarrow B$ is a tautology.

PREDICATE. $P(x)$:- Statement that contain variables, sometimes referred to as predicate variable, and may be true or false depending on those variables, value or values.

Ex:-

$P(x)$: "$x+1=2$"

for $x=1$ statement is true.

but $x \neq 1$ statement is false.

Ex2: $P(x): x>2$

$P(0)$:- $0>2$ false

$P(3)$: $3>2$ True.

Ex3. $P(x,y)$: '$x+y=5$'

a) Is $P(2,3)$ is true? b) Is $P(3,3)$ is true?

Soln:- a) yes, $P(2,3)$ = '$2+3=5$'

b) NO $P(3,3)$ = '$3+3 \neq 5$'!

Ex4. $P(x,y,z)$: '$x+y=z$'

$P(0,0,1)$ is true? True

$P(0,1,1)$ is true? false

Quantifier

- → Universal ($\forall$) (for all)
- → Existantial ($\exists$) (for some)

1) Universal — "P(x) for all values of x in the domain".

Ex:-

$P(x)$: '$x+1>x$' where $x \in R$

Is it true?

⇒ Yes. let $x=0$ $0+1>0$ True

$x=-2$ $-2+1>-2$

$-1>-2$ True

$\forall x \in R$ $P(x)$ is true.

2) Existantial → "There exist an element x in the domain such that P(x)".

Ex:- $x \in R$ 'P(x): '$x+1 > 3$'

Is it True for $\exists x\, P(x)$

⇒ [illegible], Yes. take $x=1$ $1+1>3$

$2>3$ false.

$x=2$ $2+1>3$

$3>3$ false

$x=3$ $3+1>3$

$4>3$ True.

~~[illegible]~~

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Ex: $\forall x\, P(x)$ where $P(x): x+1<x$

Is $\forall x\, P(x)$ true? F $x \in R$

Is $\exists x\, P(x)$ true? F

Ex. Find the range of x, for which $\forall x\, P(x)$ is true. where

$P(x): x^2 - x > 0$

a) $x \in R$ (b) $x \in (-\infty, 0)$ (c) $(0, \infty)$ (d) $x \in (-\infty, 1) \cup (1, \infty)$

✓ (e) $x \in (-\infty, 0) \cup (1, \infty)$

$P(x): x^2 - x > 0 \Rightarrow x(x-1) > 0$

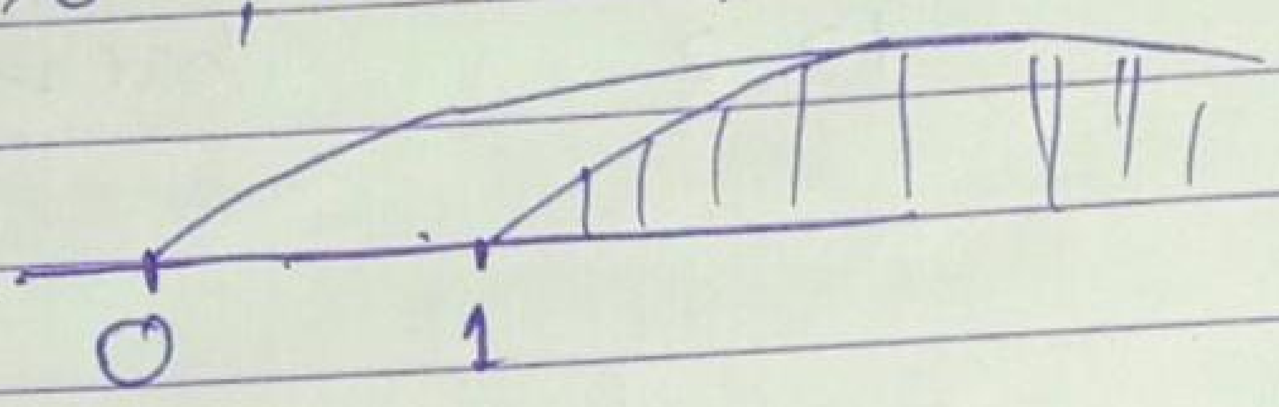
$\{ a \cdot b > 0$ either

$a > 0$ and $b > 0$

or

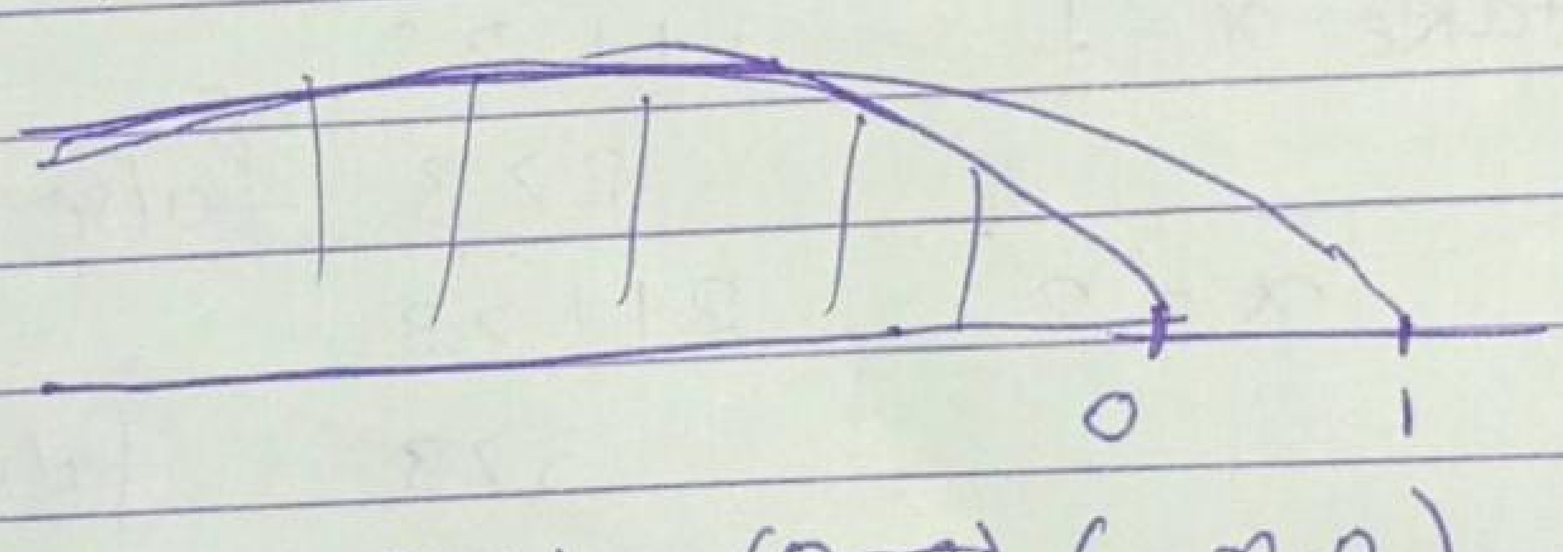
$a < 0$ and $b < 0$

(1) $x > 0$, $x - 1 > 0 \Rightarrow x > 1$



~~Common~~ $x > 1 \Rightarrow (1, \infty)$

(2) $x < 0$, $x - 1 < 0 \Rightarrow x < 1$



$x < 1$, ~~(0,∞)~~ $(-\infty, 0)$

Combing (1) and (2)

$x \in (-\infty, 0) \cup (1, \infty)$. or $R - [0, 1]$

Ex 2. $P(x): x^2 - x \geq 0$

$x \in (-\infty, 0] \cup [1, \infty)$ or $R - (0,1)$

Ex. $P(x) = x^3 - x^2 > 0$ $\forall x\, P(x)$ is true for what range of x?

Solⁿ:- $x^2(x-1) > 0$

$x > 0,\ x-1 > 0 \Rightarrow \underline{x > 1}$ - $(1, \infty)$

Ex:- $\forall x\, P(x)$ where $P(x): x+1 < x$ $\quad$ Repeated

a) Is $\forall x\, P(x)$ true or false? $x \in R$

Solⁿ:- false ~~be~~ ~~If x=0~~

b) Is $\exists x\, P(x)$ true or false $x \in R$.

Solⁿ:- false.

Ex:- Find the range of x for which, $\forall x\, P(x)$ is true?

where $P(x): x^2 - x > 0$.

(a) $x \in R$ $\quad$ (b) $x \in (-\infty, 0) \cup (0, \infty)$ $\quad$ (c) $x \in (-\infty, 1) \cup (1, \infty)$

(d) $x \in (-\infty, 0) \cup (1, \infty)$

Solⁿ:-

$x^2 - x > 0$

$\Rightarrow x(x-1) > 0 \qquad [a.b > 0]$

$\Rightarrow \underline{x > 0 \quad x-1 > 0}$ $\quad$ | $\quad$ $x < 0 \quad x-1 < 0$

$x > 0 \quad x > 1$ $\quad$ | $\quad$ $\underline{x < 0} \Downarrow x < 1$

$\Downarrow$

$(1, \infty)$ $\qquad$ ~~(0, ∞)~~ $(-\infty, 0)$

$(-\infty, 0) \cup (1, \infty)$

Negation of Quantifier (De morgans law of Quantifier)

$\sim(P \vee Q) \equiv \sim P \wedge \sim Q$
$\sim(P \wedge Q) \equiv \sim P \vee \sim Q$

		When is ~ true?	when False?
$\sim(\forall x\, P(x))$	$\equiv \exists x \sim P(x)$	For every x, $P(x)$ is false.	There is an x for which $P(x)$ is true.
$\sim(\forall \exists x\, P(x))$	$\equiv \forall x \sim P(x)$	Their is an $P(x)$ for which $P(x)$ is false.	$P(x)$ is true for every x.

Example. Find the negation of $\forall x P(x)$, where $P(x): x^2 > x$.

(a) $\exists x\, (x^2 = x)$
(b) $\exists x\, (x^2 \geq x)$
(c) $\exists x\, (x^2 < x)$
(d) $\exists x\, (x^2 \leq x)$

Point (Imp)

$>$	$\xrightarrow{opp}$	$\leq$
$<$	$\xrightarrow{opp}$	$\ngeq$
$\geq$	$\xrightarrow{opp}$	$<$
$\leq$	$\xrightarrow{opp}$	$>$

~~$\sim P(x)$~~ : $\sim \forall x\, P(x)$
$\equiv \exists x \sim P(x)$
$\equiv \exists x \sim (x^2 > x)$
$\equiv \exists x\, [x^2 \leq x]$

Q2. Find the negation of $[\sim \exists x\, (x^2 = x)] = ?$

Sol^n. $\forall x\, [\sim(x^2 = x)] \equiv \forall x\, [x^2 \neq x]$

Q3 $\sim \exists x\, [P(x) \rightarrow Q(x)] = ?$

a) $\forall x\, [P(x) \leftrightarrow Q(x)]$
b) $\forall x\, [\sim P(x) \vee Q(x)]$
(c) $\forall x\, (P(x) \wedge \sim Q(x)]$
(d) $\forall x\, [P(x) \vee \sim Q(x)]$

$P(x) \rightarrow Q(x) = \sim P \vee q$

$\Rightarrow \forall x\, [\sim(\sim p \vee q)]$
$\Rightarrow \forall x\, [p \wedge \sim Q]$.

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6 Sep 2021

Proof.

Qn. 1 $\sqrt{2}$ is an irrational number prove it.
2 If n is odd, n^2 is also odd prove it.

1. Direct proof — { condition true { consider Conclusion false — 2 preposition
2. Proof by contraposition — 2 preposition
3. Proof by contradiction — 1 preposition
4. Vacuous proof
5. Trivial

Direct Proof.

Ex. If (n is an odd integer), the (n^2 is also odd.)
p q

Proof. logical statement $P \to Q$

Condition Conclusion.

Consider : 'p is true'.
i.e n is an odd integer

So, $n = 2k+1$

$$n^2 = (2k+1)^2$$
$$= 4k^2 + 4k + 1$$
$$= 2[2k^2 + 2k] + 1$$
$$= 2P + 1$$

Where $P = 2k^2 + 2k = $ int.

So, $p = $ int.

$n^2 = 2p + 1 = 2(\text{int}) + 1$

$\Rightarrow n^2$ is odd.

Hence proved.

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Ex: Proof by contraposition

Ex:- n is an integer $\underbrace{\text{if } 3n+2 \text{ is odd}}_{P}$, $\underbrace{\text{then } n \text{ is odd}}_{Q}$.

$P \to Q$. [By direct proof]

$$3n+2 = 2K+1$$
$$\Rightarrow 3n+1 = 2K$$
$$\Rightarrow n = \frac{2K-1}{3}$$
$$= \frac{2}{3}K - \frac{1}{3}$$

{we are not able to find whether n is odd or even}

By method of contraposition

consider ~Q is true / Q is false.

i.e., n is even
$n = 2K$ K = integer

$3n+2 = 3(2K)+2 = 2[3K+1]$ ~~= even num~~
Now, K is an integer
Thus, $3K+1$ = is also an integer

$3n+2 = 2 \times (\text{integer})$

But, the given condition '$3n+2$' is odd.
i.e, our consideration is false
i.e, (n is an odd integer) proved.

Proof by Contradiction

Ex:- Prove that $\underbrace{\sqrt{2} \text{ is irrational number.}}_{p}$

Solⁿ:- Let, $\sqrt{2}$ is rational number

$\sim p$ is true / p is true.

Direct Proof :-

① Statement should be implication type $(p \to q)$

② Consider $\boxed{p \text{ is true}}$ then, prove q is true.

→ Assumption.

Contraposition

① Statements should be $p \to q$ type

② Initially consider $\sim q$ is true / q is false.

Contradiction

① Statement should be single type (1 proposition)

② Initially consider $\sim p$ is true / p is false.

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Q 'p → q'   'If p then q'.

If we consider, ~q is true initially, then what kind of proof is this?

⇒ we are considering, conclusion as false.
So, this is contraposition method.

Trivial proof.

p → q is given, when the condition 'p' is not all required to prove q is true.

Eg $P(n)$: (If $\overbrace{\boxed{a \geq b}}^{p}$, then $\overbrace{\boxed{a^n \geq b^n}}^{q}$), prove that $P(0)$ is true.

Proof :- ~~P(n)~~ $a^n \geq b^n$

$\Rightarrow n = 0$

$a^0 \geq b^0$

$1 \geq 1$, at

To prove, 'p' is not at all required, to prove q is true..

Vacuous Proof :-

Logic defines a vacuous proof as one where a statement is true because its hypothesis is false.

Suppose p → q is given,

$\boxed{\text{If } p \text{ is false then } p \to q \text{ is true.}}$

Ex:- ~~(If~~ n>1 then $n^2 > n$)

· If $Q(0) = ?$

Sol →

$n = 0$.

$0 > 1$ Condition fail

$0^2 > 0$ Condition fail

If ——→ ——·——