Logic !

Makes Sense!

p, q are propositions

$\neg p$, $p \wedge q$, $p \vee q$

BIG: $p \Rightarrow q$, If p, then q

$p \Leftrightarrow q$, p if and only if q.

$\neg(\neg p)$ equivalent to p

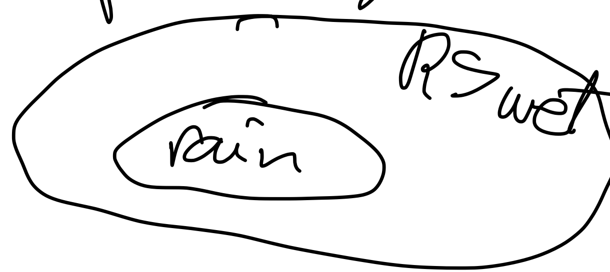
$$\neg(p \wedge q) \Longleftrightarrow (\neg p) \vee (\neg q)$$

De Morgan's Law

$$\neg(p \vee q) \Longleftrightarrow (\neg p) \wedge (\neg q)$$

$$\neg(p \Rightarrow q) \Longleftrightarrow p \wedge (\neg q)$$

rain $\Rightarrow$ RS wet



Language around "implication"

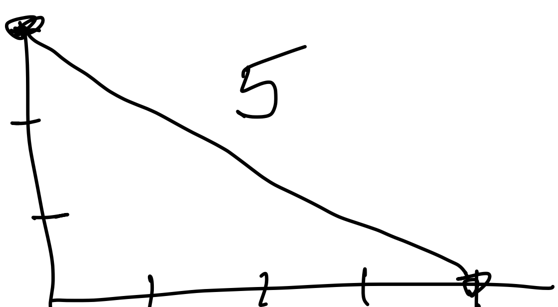
conclusion

hypothesis

$p \Rightarrow q$ an implication

$q \Rightarrow p$ the CONVERSE

Pythagorean Thm If right triangle, then $a^2+b^2=c^2$.



CONTRAPOSITIVE

$\neg q \Rightarrow \neg p$

Contrapositive

$p \Rightarrow q$ the neg. is $p \wedge \neg q$

$\neg q \Rightarrow \neg p$ the neg. is $\neg q \wedge p$

I deduce that the contrapositive is equivalent to the original implication.

$$2x^2 - x \geq 0$$

$x = -1$ $\quad 2\cdot 1 + 1 = 3$ $\quad 3 \geq 0$ T

Propositional function or PREDICATE

Domain

Universe of discourse

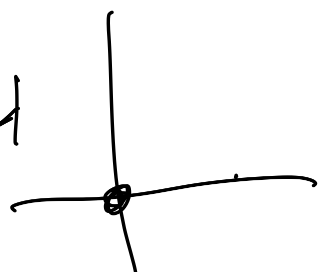
$P(x)$

x specific value
it becomes a prop.

$x = 1/4$

$$2\cdot\frac{1}{16} - \frac{1}{4} = -\frac{1}{8} \geq 0$$

F



Quantifiers

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

$\forall x \in \mathbb{R} \ P(x)$

Proposition

$\forall x \in \mathbb{R} \ 2x^2 - x \geq 0$ FALSE

$\exists x \in \mathbb{R} \ 2x^2 - x \geq 0$ TRUE