Logic

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De Morgan's laws:

- $\neg(p \vee q) \equiv \neg p \wedge \neg q$
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Usage:

De Morgan's laws allow us to negate complex logical statements and to rewrite them in a different form that may be easier to understand or manipulate

Implication $p \Rightarrow q$

Def: An implication $p \Rightarrow q$ is a true if p is false or q is true.

p	q	$p \Rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

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> "innocent until proven guilty"
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- $(q \Rightarrow p)$: converse of $p \Rightarrow q$
- $(\neg p \Rightarrow \neg q)$: contrapositive of $p \Rightarrow q$
- $p \Rightarrow q \equiv \neg q \Rightarrow \neg p \equiv (\neg p) \vee q$

If and only if $p \Leftrightarrow q$

$$p \Leftrightarrow q \equiv (p \Rightarrow q) \wedge (q \Rightarrow p)$$

Quantifiers

- $\neg(\forall x, p(x)) \equiv \exists x, \neg p(x)$
- $\neg(\exists x, p(x)) \equiv \forall x, \neg p(x)$