To pick up on Monday, 2/6

Last time we ended w/ a def. of tautology. We'll pick up there and then fill in some more of what I skipped on Friday.

(go back to those notes)

tautology ex: $(p \Rightarrow q) \wedge p$

p	q	$p \Rightarrow q$	$(p \Rightarrow q) \wedge p$
T	T	T	T
T	F	F	F
F	T	T	F
F	F	T	F

Q Suppose we have propositions p, q, r. How many rows does the truth table have?

A. 2^n. One for each of $\{T,F\}^n$.

$$\underbrace{\{T,F\} \times \{T,F\} \times \cdots \times \{T,F\}}_{n \text{ times}}$$

So for $n=3$,

$\{T,F\} \times \{T,F\} \times \{T,F\} = \{\langle T,T,T\rangle, \langle T,T,F\rangle, \cdots\}$

Def (again) 2 propositions p, q are logically equivalent, written $p \equiv q$, iff their truth tables are the same.

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

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

recall De Morgan's Law: $\overline{A \cup B} = (\bar{A} \cap \bar{B})$

Precedence rules

parentheses

1. $\neg$
2. $\vee, \wedge, \oplus$
3. $\Rightarrow$
4. $\Leftrightarrow$

break ties left to right

A drill question: how many rows does the truth table for $a \Rightarrow (b \vee (c \wedge \neg a))$ have?

3 variables, so $2^3 = 8$.

Let's see what that looks like:

a	b	c	¬a	c ∧ ¬a	b ∨ (c ∧ ¬a)	a ⇒ (b ∨ (c ∧ ¬a))
T	T	T				
T	T	F				
T	F	T				
T	F	F				
F	T	T				
F	T	F				
F	F	T				
F	F	F				