Lecture 1: Propositional calculus — Math 345

Wednesday, September 22, 2010 — Jim Fowler

Go through names

Syllabus

Inspirational message about the history of mathematics.

Textbook

This lecture discusses section 2 of the textbook.

Homework

The homework is due Monday, September 27, 2010.

From Section 2 of the textbook, do exercises 1, 2, and 5.

Logic

Assign truth values to sentences

not all sentences have a truth value

Propositional calculus

assign truth values to compound sentences, based on truth values of simpler sentences

Symbols

$\neg \quad \wedge \quad \vee \quad \Rightarrow \quad \Leftrightarrow$

Not

double negation

logical equivalence (denoted by $\equiv$, which is not a symbol of the propositional calculus)

Conjunction $\wedge$

make truth table

Disjunction $\vee$

make truth table

compare this to English

DeMorgan's laws

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

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

Proof via truth table

proof via words

which is better?

Distributive laws

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

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