

# Math 415

Math(s) = tricks & rules!

qps, mechanics, "Same"  
laws, ...

things that are

logic: truth / lie

$3x^2 - 4 = 2$  →  
 $3x^2 = 6$  →  
 $x^2 = 2$  →  
 ~~$x = \pm \sqrt{2}$~~   
 $x = \sqrt{2}$

"Same"

$3x^2 - 4 + 4 = 2 + 4$   
 $3x^2 + 0 = 6$   
 $\frac{1}{3} 3x^2 = 6(\frac{1}{3})$

$x = 2$

$x^2 = 2$   
 $x^2 = 2$

$x^2 - 2 = 0$

$(x + \sqrt{2})(x - \sqrt{2}) = 0$

$x + \sqrt{2} = 0$     $x - \sqrt{2} = 0$

# Logic

Predicate / propositional logic.

declarative statement that is true or false, but not both.

declare a property about some object.

Predicate

Mark is silly.

operations:

new objects from old objects.

Compound Propositions

Propositions

$P_1$

$P_2$

conjunctive

and

but

yet

" $\wedge$ "

disjunctive

or

inclusive

" $\vee$ "

or

exclusive.

" $\oplus$ "

$P_1$	$P_2$	$P_1 \wedge P_2$	$P_1 \vee P_2$	$P_1 \oplus P_2$
T	T	T	T	F
T	F	F	T	T
F	T	F	T	T
F	F	F	F	F

if  $P_1$ , then  $P_2$  (con.)  
 $\Downarrow$   
 Sufficient  
 $\Downarrow$   
 nec.

$P_1$	$P_2$	$P_1 \rightarrow P_2$
T	T	T
T	F	F
F	T	T
F	F	T

if and only if  $P_1 \leftrightarrow P_2$

$P_1$	$P_2$	$P_1 \leftrightarrow P_2$
T	T	T
T	F	F
F	T	F
F	F	T

not  $\sim$  or  $\neg$   
 "it is not the case that  $P_1$ "

$P_1$	$\neg P_1$	$\neg(\neg P_1)$
T	F	T
F	T	F

logically same  $P_1 \equiv P_2$

means:  $(P_1 \leftrightarrow P_2)$  is always true.

tautology