

Math Review

\mathbb{N} : natural numbers
 $\{0, 1, 2, \dots\}$

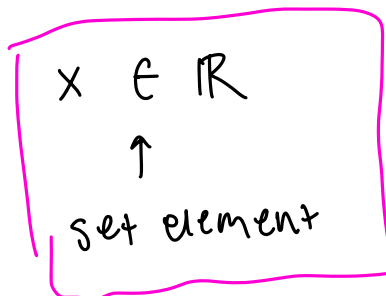
\mathbb{Z} : integers
 $\{-1, 1, -2, 2, 0, \dots\}$

\mathbb{Z}^+ : positive integers
 $\{1, 2, \dots\}$

\mathbb{R} : real numbers
 $\{-2, 2.5, \pi\}$

\mathbb{Q} : rational numbers
 m/n , m and n are integers

\mathbb{C} : $\{i, 2i+1, \pi\}$



$y \in (0, 5]$ $y \in \mathbb{Z}$
 $\{1, 2, 3, 4, 5\}$

(a, b) where $a \in \mathbb{R}, b \in \mathbb{R}$

$(a, b) \in \mathbb{R}^2$ \times squared numbers \times

exponents and logs

b^n , $b^0 = 1$, b^{-5} or $b^{1/2} = \sqrt{b}$, $b^{-1} = 1/b$

rules: $b^x b^y = b^{x+y}$

$b^x a^x = (ba)^x$

$(b^x)^y = b^{(xy)}$

$y = b^x \iff x = \log_b y$ if $b > 1, y > 0$

if b not given, assume $b = 2$

$$b^{\log_b(x)} = x$$

$$\log_b(xy) = \log_b x + \log_b y$$

$$\log_b(x^y) = y \cdot \log_b x$$

$$\star \log_b x = \log_a x \log_b a$$

$$\log_a x = \frac{\log_b x}{\log_b a}$$

$$k! = 1 \cdot 2 \cdot \dots \cdot k$$

$$\max(x, y) = \text{bigger of } x \text{ \& } y$$

$$\lfloor 3.7 \rfloor = 3$$

$$\lceil 3.7 \rceil = 4$$

$$\lfloor -2.1 \rfloor = -3$$

$$\lceil -2.1 \rceil = -2$$

Logic

propositional logic

proposition: a statement which is either true or false

ex) 5 is odd

we are in Siebel right now

complex proposition: Naina is from PA and Charlotte is from NY

(T) or F

⏟

P

(T) or F

⏟

Q

and : \wedge

or : \vee

implies : \longrightarrow

not : \neg (on a single proposition)

truth tables = definition

inclusive

P	q	$P \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

P	q	$P \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

vacuous

P	q	$P \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

if it is raining, then I will bring an umbrella.
 $\frac{P}{\text{if it is raining}}, \frac{q}{\text{then I will bring an umbrella.}}$

P	$\neg P$
T	F
F	T

logical equivalence

two statements are logically equivalent if they evaluate to True / False under the same conditions.

De Morgan's Laws.

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

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