Final

May 6, 9 am

Midterms

① Feb 18, Wed

② Mar 30, Mon

Homework due Thursday night
(HW 1 Jan 22)

LaTeX files will be available on Overleaf.

Linear algebra is about systems of linear equations

We will work with SETS

Sets: Collections of things

Example:

$$\mathbb{N} = \{1, 2, 3, 4, 5, \ldots\}$$

"blackboard $\mathbb{N}$"

"\mathbb{N}"

Rmk: (1) Sets have two forms of containment:

(a) Subset relationship

$\mathbb{N} \subseteq \mathbb{Z} = \{0, \pm 1, \pm 2, \pm 3, \ldots\}$

↑ "is a subset of"

(1) membership

$1 \in \mathbb{N}$

↑ "belongs to"

Example

$\{\text{People named Bartholomew}\} \subsetneq \{\text{People}\}$

↑ "is a proper subset"

$\emptyset = \{\text{People named Xyzztuv}\}$

↑ "empty set"

Notation:

$\forall$: "For every" or "For all"

$\exists$: "There exists" or "There is"

- $\forall n \in \mathbb{N},\ n > 0$ ✓
- $\exists$ person $\in$ {people} s.t. ("such that") their name is Bartholomew ✓

Thm (Euclid)

There are infinitely many prime numbers.

Def^n A prime number is an integer $p \in \mathbb{N}$ s.t. p cannot be written as a product $p = ab$ with $a, b \in \mathbb{N}$ & $a, b < p$. Moreover $p \neq 1$.

Pf: Suppose that we have any finite set of primes

$\{p_1, p_2, p_3, \cdots, p_r\}$

$N = p_1 p_2 \cdots p_r + 1$

N has remainder 1 when divided by $p_1, p_2, \cdots, p_r$

If $q \mid N$ is a prime number

$\Downarrow$

"q divides N"

Then $q \notin \{p_1, p_2, \cdots, p_r\}$

$\Downarrow$

"does not belong to"

"Q.E.D." $\rightarrow$