

Final

May 6, 7 am

Midterms

① Feb 18, Wed

② Mar 30, Mon

Homework due Thursday night  
(HW 1 Jan 22)

$\text{\LaTeX}$  files will be available

on Overleaf.

Linear algebra is about systems  
of linear equations

We will work with SETS

Sets: Collections of things

Example:

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

"blackboard N"

"\mathbb{N}"

Rmk: (1) Sets have two

forms of Containment:

(a) Subset relationship

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

↑  
" is a subset  
of "

(L) membership

$i \in N$

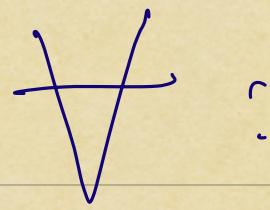
↑  
"belongs to"

Example

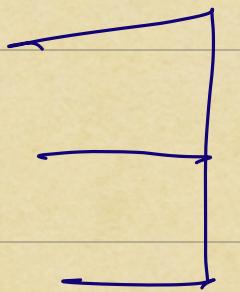
{ People  
Named  
Bartholomew }  $\subset$  { People }  
" is a  
proper subset"  $\cup \setminus$

$\emptyset = \{ \text{People Named XYZTUV} \}$   
"empty set"

Notation:



"For every"  
or  
"For all"



"There exists"  
or  
"There is"

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

# Thm (Euclid)

There are infinitely many prime numbers.

Def<sup>n</sup> 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  $p \neq 1$ .

If: Suppose that we have any finite set of primes

$\{P_1, P_2, P_3, \dots, P_r\}$

$$N = P_1 P_2 \cdots P_r + 1$$

$N$  has remainder 1 when divided by  $P_1, P_2, \dots, P_r$

If  $q | N$  is a prime number

" $q$  divides  $N$ "

Then  $q \notin \{P_1, P_2, \dots, P_r\}$

"does not belong to"

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