


HW 0

SETS



Topic 0 - Sets

①

Def: A set is a collection of objects. The objects in the set are called the elements of the set.

If S is a set and x is an element of the set S then we write $x \in S$.

read:

" x is in S "

If x is not an element of S then we write $x \notin S$.

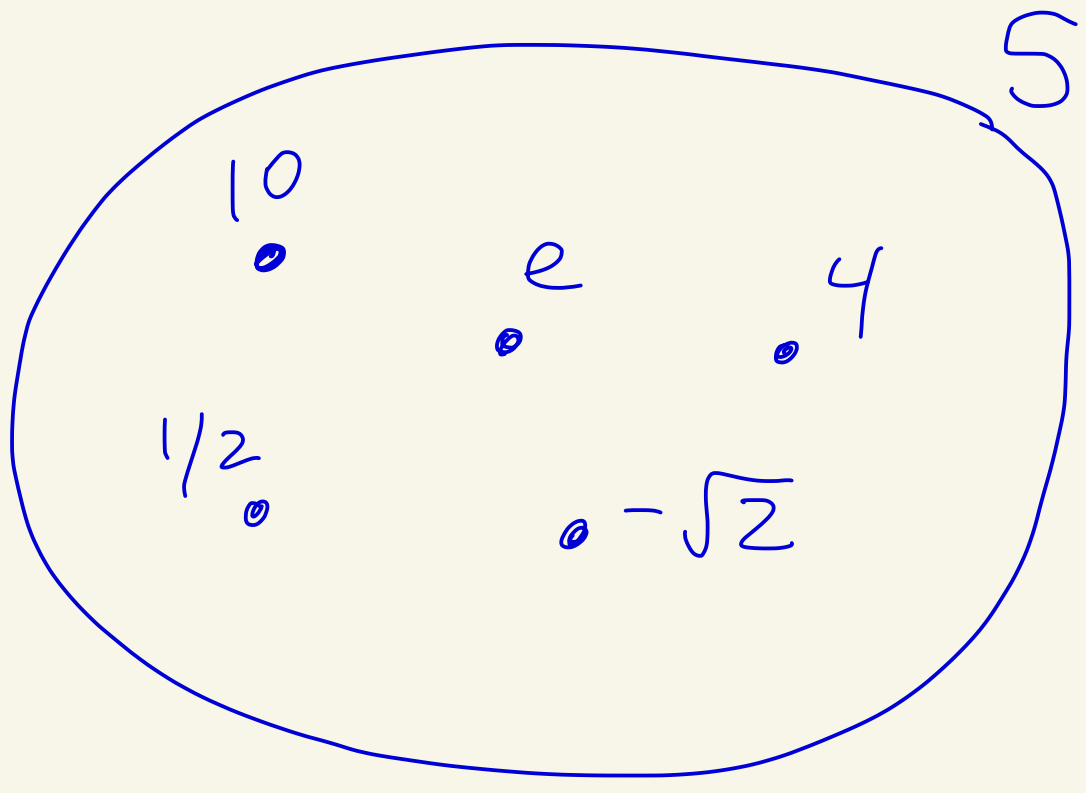
read:

" x is not in S "

Ex:

$$S = \{10, \frac{1}{2}, e, 4, -\sqrt{2}\}$$

$e \in S$
 $\frac{1}{3} \notin S$



Note: In a set, order doesn't matter. So, for example

$$S = \{10, \frac{1}{2}, e, 4, -\sqrt{2}\}$$

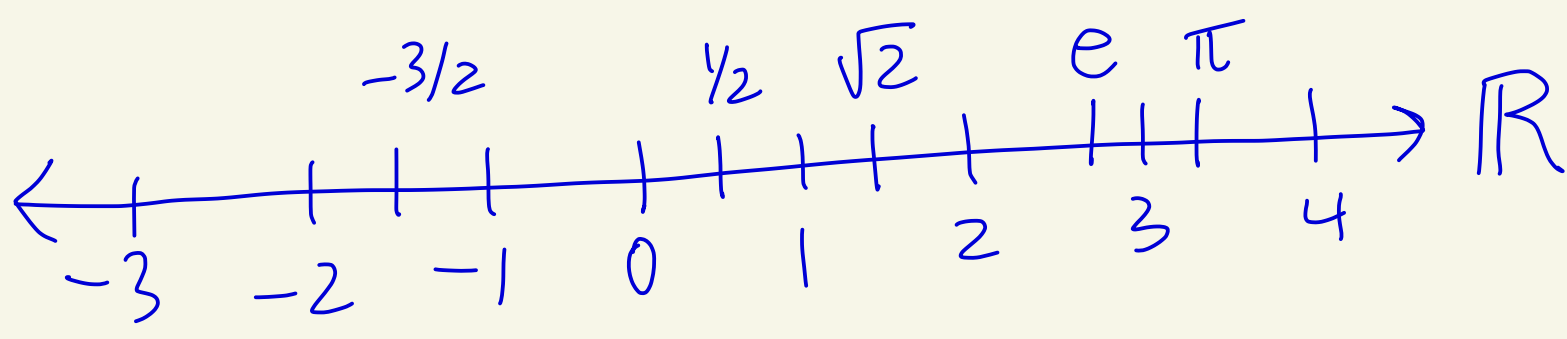
$$= \{\frac{1}{2}, -\sqrt{2}, 4, e, 10\}$$

Note: In a set you can't have duplicates. So, $\{1, 1, 2\}$ isn't a set.

If someone wrote $\{1, 1, 2\}$ then they really mean $\{1, 2\}$

④

Ex: \mathbb{R} denotes the set of real numbers. The real numbers are the numbers on the number line with decimal expansions.



$$\mathbb{R} = \left\{ 0, 1, -3, \frac{1}{2}, 0.673, \pi, e, \sqrt{2}, \dots \right\}$$

infinite
many
more

$$\frac{\pi}{10} \approx 0.314159... \in \mathbb{R}$$

$$-10,000 \in \mathbb{R}$$

$$i \notin \mathbb{R}$$

$$\sqrt{-3} \notin \mathbb{R}$$

$$[\text{here } i^2 = -1]$$

Notation:

⑤

$x, y \in S$ is shorthand for $x \in S$ and $y \in S$.

read: "x is in S and
y is in S"

Ex: $10, \sqrt{2} \in \mathbb{R}$

shorthand for: $\sqrt{10} \in \mathbb{R}$ and $\sqrt{2} \in \mathbb{R}$

Ex: $0, 1, \frac{1}{2}, -\sqrt{2} \in \mathbb{R}$

shorthand for: $0 \in \mathbb{R}, 1 \in \mathbb{R},$
 $\frac{1}{2} \in \mathbb{R}, -\sqrt{2} \in \mathbb{R}$

General way to define a set

6

description of
what the
elements look
like

condition that
the elements
must satisfy to
be in the set

some people use
• instead of |
•

read | as "such that" or
"where"

Ex:

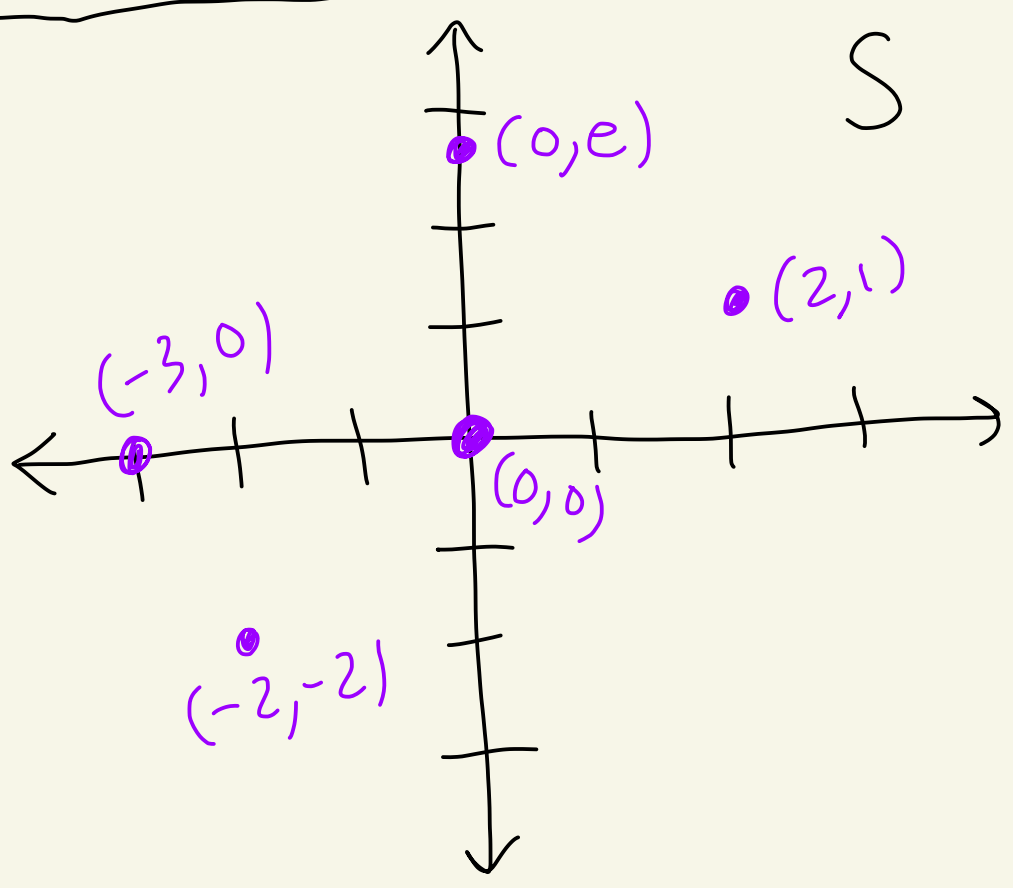
$$S = \{ (x, y) \mid x \in \mathbb{R} \text{ and } y \in \mathbb{R} \}$$

could also write as "x, y ∈ ℝ"

read: S consists of all (x, y) where x and y are real numbers

$$S = \{ (0, 0), (-2, \frac{1}{2}), (\pi, e), \dots \}$$

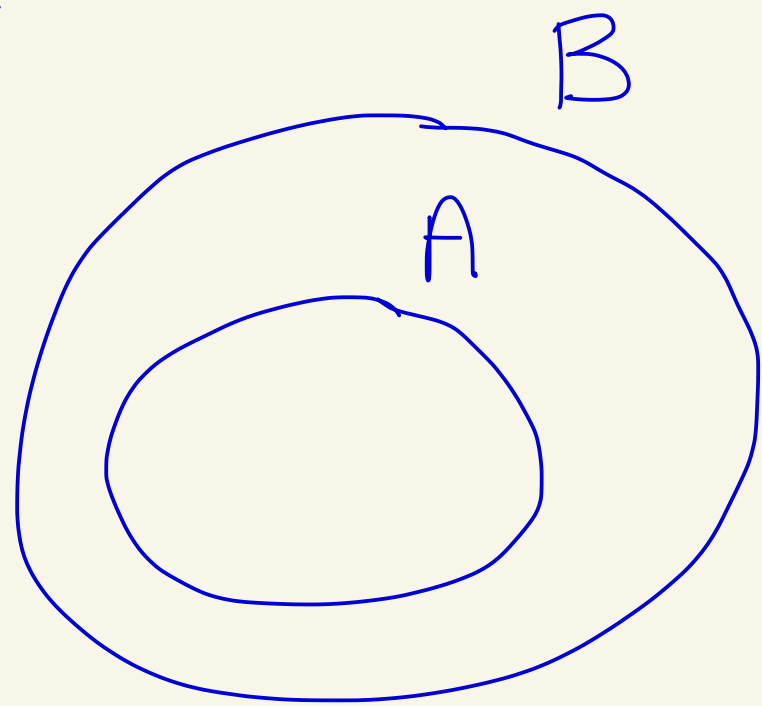
infinitely many more



S is the xy-plane

Def: The empty set, (8)
denoted by ϕ or $\{\}$,
is defined to be the
set with no elements.

Def: Let A and B be sets.
We say that A is a subset
of B if every element of
 A is also an element of B .



If A is a
subset of
 B then we
write $A \subseteq B$

means
subset

Ex:

9

Let

$$A = \{6, 4, 789\}$$

$$B = \left\{3, \frac{1}{2}, 6, \pi, 789, 4\right\}$$

Then $A \subseteq B$

