

Precalculus

Interval notation, the \in and the \cup symbols

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Outline

- 1 Interval notation
- 2 Inequalities and interval notation

Review of standard interval notation

- If you are familiar with all aspects of the following notation:

$$x \in (-\infty, 7) \cup (9, 12],$$



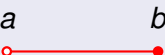
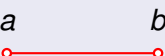
feel free skip the next slides.

- In particular, in the next two slides we cover:
 - the open/closed/semi-closed interval notation;
 - the “belongs to” \in sign;
 - the union \cup sign.

Let $a < b$ be two real numbers.

Definition (Interval notation)

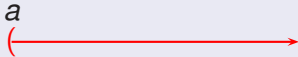
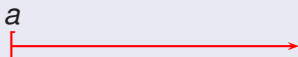
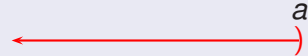

The set (interval) of all real numbers from a to b is denoted as follows.

| Notation | Endpoints | Picture |
|----------|-------------------------------|--|
| $[a, b]$ | including both a and b |  or $[\text{---}]$ |
| $[a, b)$ | including a but not b |  or $[\text{---})$ |
| $(a, b]$ | including b but not a |  or $(\text{---}]$ |
| (a, b) | including neither a nor b |  or (---) |

Let a be a number.

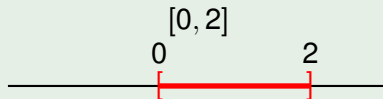
Definition (Infinite intervals)

The set of all numbers greater than/smaller than a is denoted with the help of the ∞ symbol.

| Notation | Endpoint | Picture |
|----------------|--|--|
| (a, ∞) | pts. to the right of a excluding a |  |
| $[a, \infty)$ | pts. to the right of a including a |  |
| $(-\infty, a)$ | pts. to the left of a excluding a |  |
| $(-\infty, a]$ | pts. to the left of a including a |  |

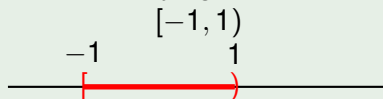
Example

Write the set of numbers x satisfying $0 \leq x \leq 2$ in interval notation.



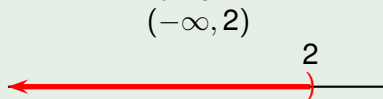
Example

Write the set of numbers x satisfying $-1 \leq x < 1$ in interval notation.



Example

Write the set of numbers x satisfying $x < 2$ in interval notation.



Definition

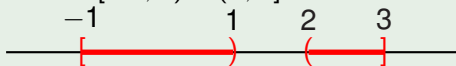
Let A and B be sets.

- The union of A and B is the set consisting of the elements in A and the elements in B , without additional elements.
- The union of A and B is denoted by

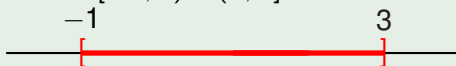
$$A \cup B$$

Example

Plot the points in the set $[-1, 1) \cup (2, 3]$.



Plot the points in the set $[-1, 2) \cup (1, 3]$.



- To draw the points of a union draw both on top of one another.

Definition

Let A be a set. The notation

$$x \in A$$

is read as

- x belongs to A or
- x is an element of A .

Example

Express the statement $-1 < x \leq 2$ using the \in symbol and the interval notation.

$$x \in (-1, 2]$$

Express the statement $x < 0$ or $1 \leq x < 2$ using the \in symbol and the interval notation.

$$x \in (-\infty, 0) \cup [1, 2)$$