

Intervals

1 Why

We name and denote subsets of the set of real numbers which correspond to segments of a line.

2 Definition

Take two real numbers, with the first less than the second.

An *interval* is one of four sets:

- 1. the set of real numbers larger than the first number and smaller than the second; we call the interval *open*.
- 2. the set of real numbers larger than or equal to the first number and smaller than or equal to the second number; we call the interval closed.
- 3. the set of real numbers larger than the first number and smaller than or equal to the second; we call the interval open on the left and closed on the right.
- 4. the set of real numbers larger than or equal to the first number and smaller than the second; we call the interval *closed on the left* and *open on the right*.

If an interval is neither open nor closed we call it half-open or half-closed

We call the two numbers the *endpoints* of the interval. An open interval does not contain its endpoints. A closed interval contains its endpoints. A half-open/half-closed interval contains only one of its endpoints. We say that the endpoints *delimit* the interval.

2.1 Notation

Let a, b be two real numbers which satisfy the relation a < b.

We denote the open interval from a to b by (a, b). This notation, although standard, is the same as that for ordered pairs; no confusion arises with adequate context.

We denote the closed interval from a to b by [a, b]. We record the fact $(a, b) \subset [a, b]$ in our new notation.

We denote the half-open interval from a to b, closed on the right, by (a, b] and the half-open interval from a to b, closed on the left, by [a, b).