$\Leftarrow$ Suppose (s_n) is Cauchy.

By HW 2.12.4 (s_n) is bounded.

By Bolzano-Weierstrass (s_n) has a convergent subsequence (s_{n_k}), Let L be the limit of (s_{n_k}).

Choose $\epsilon > 0$, and let $N_1 \in \mathbb{N}$ s.t for all $m, n > N_1$ $|s_n - s_m| < \frac{\epsilon}{2}$

As $(s_{n_k}) \to L$, we may choose $N_2 \in \mathbb{N}$ s.t. $|s_{n_k} - L| < \frac{\epsilon}{2}$ for all $k \geq N_2$.

~~Now choose $N = \max\{N_1, N_2\}$, and choose $n_k \geq N_2$.~~

Let $n \geq N_1$, and let $m = n_k$ for some $k \geq N_2$.

Then $|s_n - L| = |s_n - s_m + s_m - L| \leq \underbrace{|s_n - s_m|}_{\leq \epsilon/2} + \underbrace{|s_m - L|}_{\leq \epsilon/2} = \epsilon$. $\square$.

HW 2.12 3, 4, 6

§4 Sets of real numbers

§4.1 read this.

§4.2 Points

Q: $f(x) = 0 \leftarrow$ solution set is a subset of $\mathbb{R}$, need to describe this.

Def^n $[a,b]$ closed interval $\{x \in \mathbb{R} \mid a \leq x \leq b\}$.

(a,b) open interval $\{x \in \mathbb{R} \mid a < x < b\}$

Def^n An open nbd (a,b) containing a point x is called a neighbourhood of x.

$(a,b) \setminus \{x\}$ is called the deleted neighbourhood of x.

Note each point $x \in (a,b)$ has many neighbourhoods in (a,b).

Def^n $E \subset \mathbb{R}$. x is an interior point of E if there is a $c > 0$ such that $(x-c, x+c) \subset E$.

Equivalently x is an interior point of E if E contains an (open) nbd of x.

Examples Find interior points in: (a,b), $[a,b]$, $\mathbb{N}$, $\mathbb{R}$, $\mathbb{Q}$.
$a \neq b$